

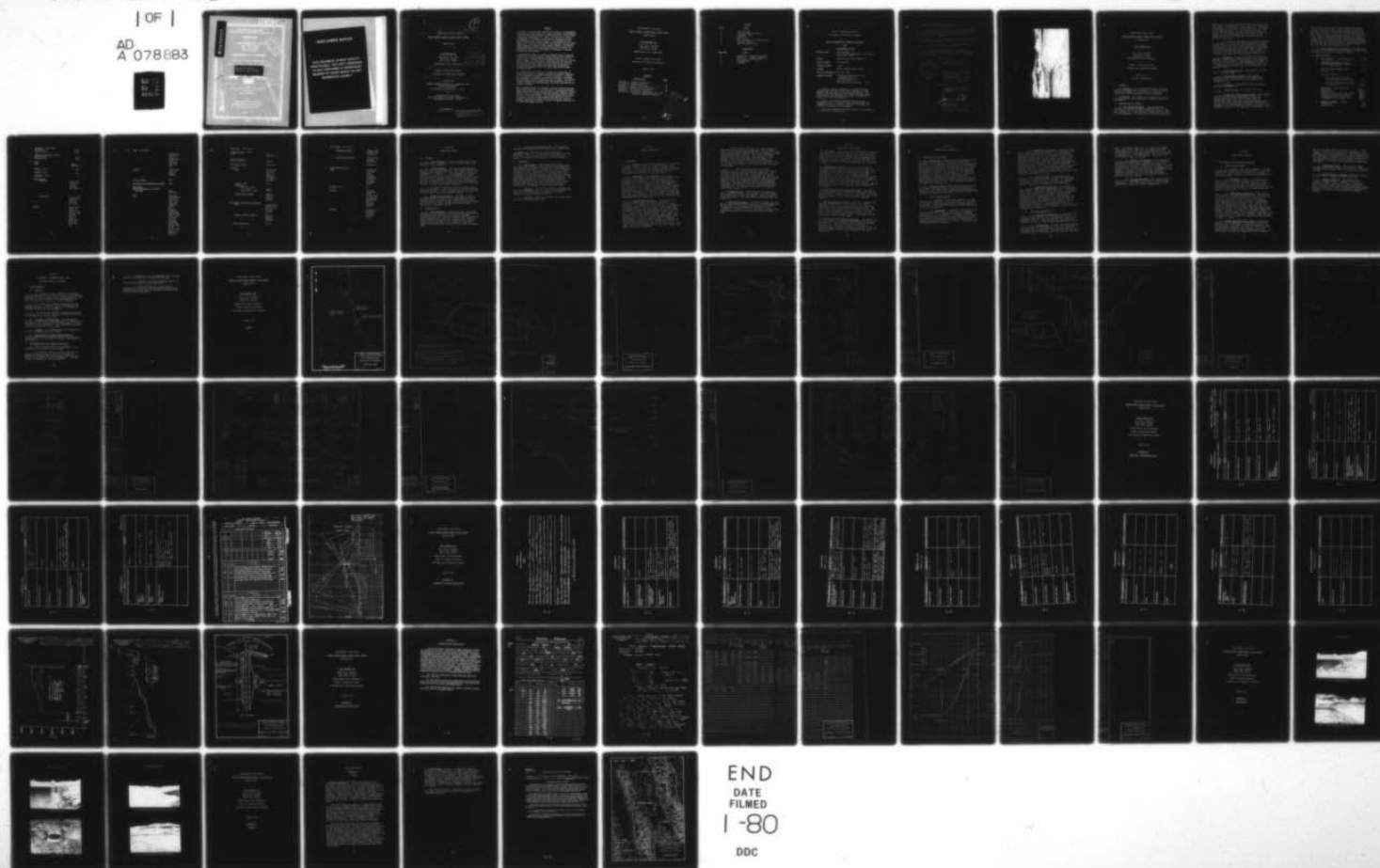
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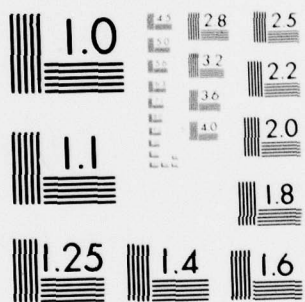
GANNETT FLEMING CORDDRY AND CARPENTER INC HARRISBURG PA F/G 13/13
NATIONAL DAM INSPECTION PROGRAM. LAKE NESSMUK DAM (NDI ID NUMBE--ETC(U)
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National Dam Inspection Program
Lake Nessmuk Dam (NDI ID PA-00032,
DER ID 59-66, SCS ID PA-601)
SUSQUEHANNA RIVER BASIN

MORRIS BRANCH, MARSH CREEK, TIOGA COUNTY

PENNSYLVANIA Phase I Inspection
Report

LAKE NESSMUK DAM

NDI ID No. PA-00032
DER ID No. 59-66
SCS ID No. PA-601

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PENNSYLVANIA FISH COMMISSION

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PHASE I INSEPCION REPORT

NATIONAL DAM INSPECTION PROGRAM

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Prepared by

GANNETT FLEMING CORDDRY AND CARPENTER, INC.
Consulting Engineers
P.O. Box 1963
Harrisburg, Pennsylvania 17105

For

DEPARTMENT OF THE ARMY
Baltimore District, Corps of Engineers
Baltimore, Maryland 21203

11 AUGUST 1979

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PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase I Investigations. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, D.C. 20314. The purpose of a Phase I investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigation, and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I investigation; however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through frequent inspections can unsafe conditions be detected and only through continued care and maintenance can these conditions be prevented or corrected.

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the spillway design flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions thereof. The spillway design flood provides a measure of relative spillway capacity and serves as an aid in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.

SUSQUEHANNA RIVER BASIN
MORRIS BRANCH, MARSH CREEK, TIOGA COUNTY
PENNSYLVANIA

LAKE NESSMUK DAM

NDI ID No. PA-00032
DER ID No. 59-66
SCS ID No. PA-601

PENNSYLVANIA FISH COMMISSION

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

AUGUST 1979

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PLATES

<u>Plate</u>	<u>Title</u>
1	Location Map.
2	Plan and Typical Section.
3	Alignment Plan.
4	Profiles.
5	Drain Plan.
6	Main Spillway and Outlet Works.
7	Cut-off Trench.
8	Main Spillway Riser.

APPENDICES

<u>Appendix</u>	<u>Title</u>
A	Checklist - Engineering Data.
B	Checklist - Visual Inspection.
C	Hydrology and Hydraulics.
D	Photographs.
E	Geology.

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

BRIEF ASSESSMENT OF GENERAL CONDITION

AND

RECOMMENDED ACTION

Name of Dam: Lake Nessmuk
NDI ID No. PA-00032/DER ID NO. 59-66
SCS ID NO. PA-601

Owner: Pennsylvania Fish Commission

State Located: Pennsylvania

County Located: Tioga

Stream: Morris Branch, Marsh Creek

Date of Inspection: (25 July 1979)

Inspection Team: Gannett Fleming Corddry and
Carpenter, Inc.
Consulting Engineers
P.O. Box 1963
Harrisburg, Pennsylvania 17105

Based on visual inspection, available records, calculations and past operational performance, Lake Nessmuk Dam is judged to be in good condition. The existing spillway can pass the Probable Maximum Flood (PMF) without overtopping of the dam. The spillway capacity is rated as adequate.

There is a slope stability analysis for the embankment, and it indicates that the embankment has adequate factors of safety. There is no evidence of problems threatening the embankment.

The visual inspection revealed that it is uncertain that the gate is operational.

The following measure is recommended to be undertaken by the Owner without delay:

(1) Either repair the outlet works gate or adopt an operating policy such that the gate is maintained annually and operated every other year to ensure its operation in case of emergency. The gate should be operated as soon as possible.

In addition, it is recommended that the Owner modify his operational procedures as follows:

(1) Develop a detailed emergency operation and warning system for Lake Nessmuk Dam.

(2) When warnings of a storm of major proportions are given by the National Weather Service, the owner should activate his emergency operation and warning system procedures.

Submitted by:



GANNETT FLEMING CORDDRY
AND CARPENTER, INC.

A handwritten signature in cursive script, reading "Frederick Futchko".

FREDERICK FUTCHKO
Project Manager, Dam Section

Date: 17 September 1979

Approved by:

DEPARTMENT OF THE ARMY
BALTIMORE DISTRICT, CORPS OF
ENGINEERS

A handwritten signature in cursive script, reading "James W. Peck".

JAMES W. PECK
Colonel, Corps of Engineers
District Engineer

Date: 25 Sep 79

LAKE NESSMUK DAM



Overview

SUSQUEHANNA RIVER BASIN
MORRIS BRANCH, MARSH CREEK, TIOGA COUNTY
PENNSYLVANIA

LAKE NESSMUK DAM

NDI ID No. PA-00032
DER ID No. 59-66
SCS ID No. PA-601
PENNSYLVANIA FISH COMMISSION

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

SECTION 1
PROJECT INFORMATION

1.1 General.

a. Authority. The Dam Inspection Act, Public Law 92-367, authorized the Secretary of the Army, through the Corps of Engineers, to initiate a program of inspection of dams throughout the United States.

b. Purpose. The purpose of the inspection is to determine if the dam constitutes a hazard to human life or property.

1.2 Description of Project.

a. Dam and Appurtenances. Lake Nessmuk Dam consists of a zoned, earthfill embankment that is 870 feet long and is 50 feet high at maximum section. The main spillway is a drop spillway located near the center of the embankment. It consists of a concrete riser that

connects to a 30-inch diameter reinforced concrete pipe (RCP) under the embankment. The top of the riser is 9.3 feet below the design top of dam elevation. A trashrack is provided at the riser. The outlet works is located at the main spillway. It consists of an 18-inch diameter RCP extending upstream from the main spillway riser. An 18-inch sluice gate is provided at the downstream end of the pipe, which outlets into the bottom of the riser.

The auxiliary spillway is at the left abutment of the dam. It is a grass-lined excavation in earth. At the control section, the auxiliary spillway has an earthen crest that is 150 feet long and 5.2 feet below the design top elevation of the dam and 4.1 feet above the top of the main spillway riser. The various features of the dam are shown on the Plates at the end of the report and on the Photographs in Appendix D.

b. Location. The dam is located on the Morris Branch of Marsh Creek, approximately 1.0 mile South of Wellsboro, Pennsylvania. Lake Nessmuk Dam is shown on the 1971 photorevision to USGS Quadrangle, Antrim, Pennsylvania, with coordinates N41°44'00" -W77°17'35", in Tioga County, Pennsylvania. The location map is shown on Plate 1.

c. Size Classification. Intermediate (50 feet high, 1,042 acre-feet).

d. Hazard Classification. High hazard. Downstream conditions indicate that a high hazard classification is warranted for Lake Nessmuk Dam (Paragraph 5.1c).

e. Ownership. Pennsylvania Fish Commission, Harrisburg, Pennsylvania.

f. Purpose of Dam. Recreation and flood control.

g. Design and Construction History. Lake Nessmuk Dam was planned under an agreement between the Pennsylvania Fish Commission (Owner), the Soil Conservation Service of the U.S. Department of Agriculture (SCS), the Tioga County Commissioners (TCC) and the Borough of Wellsboro (Borough). Under this agreement, the Owner acquired title to the land, the SCS designed the dam, the TCC supervised construction, and

the Borough maintains the dam and surrounding park. Construction funding was shared between the various agencies involved. The dam was designed between 1964 and 1965 by the SCS. The permit to construct the dam was issued in 1965, and the construction was started in 1967. The Contractor was Roger Gerhart, of Lititz, Pennsylvania. Construction was supervised by Raymond P. Tipple, Contracting Officer for the TCC; Floyd Graham, Jerome Ogden, and Harold Kemmerer, Resident Inspectors for the SCS; and Frederick Schuerz, Chief Inspector for the SCS. The dam was completed in 1968.

h. Normal Operational Procedure. The reservoir is normally maintained at the main spillway crest level. The outlet works gate is normally closed.

1.3 Pertinent Data.

a.	<u>Drainage Area.</u> (square miles)	1.63
b.	<u>Discharge at Damsite.</u> (cfs)	
	Maximum known flood at damsite (June 1972)	100
	Outlet works at normal pool elevation	46
	Spillway capacity.	
	Main spillway with pool at auxiliary spillway crest	133
	Auxiliary spillway with pool at top of dam	4,900
c.	<u>Elevation.</u> (feet above msl)	
	Top of dam	1470.2
	Maximum pool	1470.2
	Normal pool (main spillway crest)	1460.9
	Upstream invert outlet works	1426.0
	Downstream invert outlet works	1425.5
	Streambed at toe of dam	1420.5
d.	<u>Reservoir Length.</u> (miles)	
	Normal pool	0.52
	Maximum pool	0.57

e.	<u>Storage.</u> (acre-feet)	
	Normal pool	782
	Maximum pool	1,042
f.	<u>Reservoir Surface</u> (acres)	
	Normal Pool	59.5
	Maximum pool	70.0
g.	<u>Dam.</u>	
	<u>Type</u>	Zoned Earthfill
	<u>Length</u> (feet)	870
	<u>Height</u> (feet)	50
	<u>Topwidth</u> (feet)	17
	<u>Side Slopes</u>	
	Upstream	1V on 3H. There is a 10-foot berm at El. 1461.9
	Downstream	1V on 2.5H There is a 10-foot berm at El. 1444.0
	<u>Zoning</u>	Impervious core to within 8.2 feet of top of dam. A zone of less impervious fill is upstream and

g. Dam. (continued)

downstream
around
core. A
foundation
drain is
provided
near the
toe.

Cutoff

Impervious
fill in
cutoff
trench.

Grout Curtain

None

h. Diversion and Regulating Tunnel

None

i. Spillways.
Main (Principal or Service)
Spillway

Drop
Spillway

Type

Vertical
rectangular
riser 5.5
feet by 6
feet with
rounded
crest. A
wall
extends
along the
downstream
side of the
riser and
a trash-
rack is
provided
along the
three sides
of the
crest. The
riser con-
nects to a
conduit.

i. Spillways. (continued)

Length of Weir (feet)

Riser

Two at 5
One at 5.5

Crest Elevation

Top of riser

1460.9

Upstream Channel

Reservoir.

Conduit

Type

Reinforced
concrete
pipe, 2.5
feet in
diameter,
on concrete
cradle.

Length (feet)

167.3

Elevation

Upstream invert

at riser

1425.0

Downstream invert

1420.5

Downstream Channel

Impact
basin at
natural
stream.

Auxiliary (Emergency) Spillway

Type

Grass-lined
earthen cut
with 1V on
3H side
slopes.

Length of Weir (feet)

150 at
earthen
control
section

Crest Elevation

1465.0

i. Spillways. (continued)

Upstream Channel

Grass-lined
channel to
reservoir.

Downstream Channel

Grass-lined
channel
extending
to
overbank.

j. Regulating Outlets.
Type

Reinforced
concrete
pipe,
18-inch
diameter,
extending
to main
spillway
riser.

Length (feet).

96

Closure

18-inch,
unseating
head,
sluice gate
in riser at
downstream
end of
18-inch
diameter
pipe.

Access

Operator on
trashrack
at main
spillway
riser.

SECTION 2

ENGINEERING DATA

2.1 Design.

a. Data Available. Almost complete design data are available. A summary of the available data is in Appendix A and Appendix C.

b. Design Features. The dam and appurtenances are described in Paragraph 1.2a. The design features are shown on the Plates at the end of the report and on the Photographs in Appendix D. The embankment is shown on Plates 2, 3, 4, and 5, and on Photographs A and B. A plan of the subdrainage system is shown on Plate 5. The cut-off trench is shown on Plate 7. The soils at the site are susceptible to piping, as noted in Appendix E. The SCS incorporated special features, such as two-stage filters, to reduce the piping potential.

The main spillway is shown on Plates 6 and 8 and on Photograph C. The impact basin is shown on Plate 6 and Photograph D. The auxiliary spillway is shown on Plates 2 and 3 and on Photographs E and F.

c. Design Considerations. Although the main spillway design has been used successfully by the SCS for many years, it appears that the entrance to the conduit could possibly develop cavitation during certain flow conditions. Other design considerations are discussed in Sections 5 and 6.

2.2 Construction.

a. Data Available. Construction data available consist of the construction specifications, construction photographs, and reports both from the resident inspector and from the periodic construction inspections by the Commonwealth. The only adverse item noted in these reports was some cracks, believed to be surface cracks, on the embankment. An inspector from the Commonwealth noted that seeding would probably eliminate them.

b. Construction Considerations. The available information indicates that the dam is well constructed.

2.3 Operation. There are no formal records of operation. Based on information from the Owner and the SCS, all structures have performed satisfactorily, except for the outlet works gate, as noted hereafter.

2.4 Evaluation.

a. Availability. Engineering data were provided by the Bureau of Dams and Waterway Management, Department of Environmental Resources, Commonwealth of Pennsylvania (PennDER), and by the SCS. For information during the visual inspection, the SCS made available the District Conservationist, a Civil Engineer, and a Technician, and the Borough made available the Director of Parks and Recreation and maintenance personnel. The Owner made available all his pertinent information. For additional information, he also provided a Senior Project Engineer and the State Maintenance Supervisor. The SCS also researched their files for additional information upon request of the inspection team.

b. Adequacy. The type and amount of design data and other engineering data are good. The assessment is based on the combination of design data, visual inspection, and performance history.

c. Validity. There is no reason to question the validity of the available data.

SECTION 3

VISUAL INSPECTION

3.1 Findings

a. General. The overall appearance of the dam is good with a few deficiencies as noted herein. The locations of deficiencies are shown in Appendix B on Plate B-1. Survey data acquired during this inspection are presented in Appendix B. On the day of the inspection, the pool was at spillway crest.

b. Embankment. The embankment is in good condition. The downstream slope is covered with thick 2 to 3-foot high crownvetch. The upstream slope is protected by riprap to about 2.8 feet above the main spillway crest. The remainder of the embankment is covered with grass. A few small areas are almost bare. They are probably the result of being mowed too closely. The gradation of the riprap is somewhat uneven. The survey performed for this inspection revealed that the top of the embankment is above its design elevation and that the lines and grades are essentially in accordance with the design drawings. No seepage was observed on or downstream from the embankment.

c. Appurtenant Structures. The main spillway riser is in good condition with no observed deficiencies. The main spillway conduit is in good condition. The junction of the riser and the conduit is in good condition. At the conduit joints, each edge facing upstream has minor spalling. As shown on Plate 6, Joints J-10 and J-11 are separated about $3/4$ to 1 inch. Joint J-4 is separated about $1-1/4$ inches. At the junction of the conduit and the impact basin, the caulking in the joint is slightly deteriorated. The impact basin is in good condition with no observed deficiencies. There is a minor amount of brush on the stream banks downstream of the impact basin. The outfall of the foundation drain at the left side of the impact basin was discharging at a rate of 0.5 gpm. The right outfall was trickling.

The auxiliary spillway is in good condition. The grass cover is in good condition. At the right bank, a dike extends downstream from the axis of the dam to train water away from the toe of the embankment. The dike is protected by riprap. The riprap is in good condition with only one small shrub growing in the riprap. The survey performed for the inspection revealed that the crest of the auxiliary spillway is 0.1 to 0.3 foot above its design grade except for 3 feet at the left side, where it is up to 1.3 feet above its design grade.

The outlet works gate is in fair condition. The SCS Representative stated that it had not been operated since the dam was completed. He offered to operate the gate. He stated that he was confident that the gate was operational but that, if it were to be raised and then lowered, the gate would leak severely until the wedges were reset. Resetting the wedges is beyond the capabilities of the maintenance personnel. The Owner and the SCS Representative were concerned that the pool could not be maintained with a leaking gate. The inspection team did not insist on viewing its operation.

d. Reservoir Area. The reservoir has generally gentle grassed slopes. The watershed is mostly wooded, rolling hills with some farm fields. There is minor rural development in the watershed, especially near the reservoir.

e. Downstream Channel. The stream extends for 1.0 mile to Wellsboro and then beyond to its confluence with Marsh Creek. In Wellsboro alone there are at least 50 dwellings and the commercial district in the floodplain. The access road to the dam is a public road extending parallel to the reservoir along the right bank.

SECTION 4

OPERATIONAL PROCEDURES

4.1 Procedure. The reservoir is maintained at the main spillway crest, Elevation 1460.9, with excess inflow discharging over the spillway and into Morris Branch of Marsh Creek. An 18-inch diameter pipe discharges water from the reservoir. Since the outlet works pipe is intended only for drawing down the reservoir, the gate on the Lake Nessmuk Dam water discharge line is usually closed.

4.2 Maintenance of Dam. The dam is visited weekly during the winter and daily during other seasons by a caretaker who observes the condition of the dam. The caretaker is responsible for reporting any changes or deficiencies to the SCS. The Borough, with the assistance of the SCS, makes a formal inspection of the dam each year, and the records are filed. Maintenance deficiencies are corrected shortly after the inspection. Informal inspections are also made when the SCS representative is on the site for other reasons. Mowing and brush cutting on the embankment are accomplished frequently.

4.3 Maintenance of Operating Facilities. The gate on the outlet works pipe is not operated annually because of the problem noted in Section 3. Although it is usual SCS procedure to operate gates annually, the gate is not operated because of the expense of resetting the wedges.

4.4 Warning Systems in Effect. The SCS Representative and the caretaker stated that there was no formal emergency operation and warning plan. The Owner has developed a preliminary downstream warning plan. The dam is monitored continuously by a member of the Local Fire Company during periods of heavy precipitation. Contact is maintained during these periods with the Local Civil Defense Organization. The Borough follows this policy for all nearby dams.

4.5 Evaluation of Operational Adequacy. Maintenance of the dam is good. The operational adequacy of the gate is uncertain. The procedures used to inspect the dam are good, as is the correction of maintenance deficiencies. The Owner is aware of the need for a formal emergency operation and warning system, as he has developed them for other dams belonging to the Fish Commission.

SECTION 5

HYDROLOGY AND HYDRAULICS

5.1 Evaluation of Features.

a. Design Data. The hydrology and hydraulics of the design of the dam were based on standard SCS criteria. The elevation of the main spillway crest was determined by sedimentation and recreation requirements. The crest of the auxiliary spillway was set by routing the 100-year 1-hour storm. The design high water was determined by routing a storm equal to 1.25 times the 100-year 6-hour storm. The routing of this storm was not used for sizing any of the structures. The top of dam elevation and auxiliary spillway size were determined by routing the "Freeboard" storm, which is equal to twice the design high water storm (2.5 times the 100-year, 6-hour storm). The "Freeboard" storm is discussed in Paragraph 5.1d.

b. Experience Data. The maximum known flood at the damsite occurred during Tropical Storm Agnes in June, 1972, when water was 8 inches below the auxiliary spillway crest. Using the design discharge ratings, the outflow is estimated at 100 cfs.

c. Visual Observations.

(1) General. The visual inspection of Lake Nessmuk Dam, which is described in Section 3, resulted in a number of observations relevant to hydrology and hydraulics. These observations are evaluated herein for the various features.

(2) Embankment. Terminating the riprap below the top of the dam is not a universally used design criteria, but it is a standard SCS design criteria. Any potential erosion hazard is considered to be offset by the good maintenance at the dam. Any erosion on the upper parts of the embankment would be detected and repaired immediately after it occurred. This would make the erosion hazard negligible.

(3) Appurtenant Structures. The gate for the outlet works is located upstream of the impervious core and is sufficiently far upstream to be considered an upstream closure facility. It appears that at least part of the auxiliary spillway crest is slightly above the design elevation. As the flood routing for the "Freeboard" storm was accomplished using the design top elevation of the embankment and since the embankment is above the design elevation, the existing auxiliary spillway capacity is not significantly reduced from the design condition. The brush downstream of the impact basin is not thick enough to significantly raise tailwater. The maintenance personnel indicated that the brush was scheduled to be cut.

(4) Reservoir Area. No conditions were observed in the reservoir area or watershed that might present significant hazard to the dam. The assessment of the dam is based on existing conditions, and the effects of future development are not considered.

(5) Downstream Conditions. No conditions were observed immediately downstream from the dam that would create significant hazard to the dam. If the dam were to fail, a hazard to dwellings both in Wellsboro and further downstream would exist. Because of the possibility of flooding dwellings, a high hazard classification is warranted for Lake Nessmuk Dam. The SCS designed the dam assuming that it was a Class C structure. This is essentially equivalent to a high hazard classification. The Owner stated that he considered the dam to be high hazard, with "too many structures to count" in the floodplain. Access to Lake Nessmuk Dam is excellent.

d. Overtopping Potential.

(1) Spillway Design Flood. According to the criteria established by the Office of the Chief of Engineers (OCE) for the size (Intermediate) and hazard potential (High) of Lake Nessmuk Dam, the Spillway Design Flood (SDF) is the Probable Maximum Flood (PMF).

(2) Design Storm. The SCS "Freeboard" storm, which was used to determine the size of the auxiliary spillway and the top elevation of the dam, was not developed from PMF methods. However, the total rainfall of 20.8 inches is equivalent to a PMF rainfall for this

area. The assumed losses of 3.4 inches are slightly higher than those established by criteria for the Susquehanna Basin. The unit hydrograph used by the SCS is conservative. The computed peak inflow of 7,355 cfs is equivalent to a PMF peak inflow. The storm is an acceptable estimate of the PMF.

(3) Design Storm Routing. The design storm routing computations are in Appendix C. It should be noted that the SCS assumed the main spillway to be functional up to the top elevation of the dam. As there is a potential of debris blocking the trashrack, it is uncertain that the main spillway could discharge at this capacity. However, the main spillway capacity is minimal when compared to the auxiliary spillway capacity, and any reduction would have a negligible effect on the PMF routing.

(4) Spillway Adequacy. The criteria used to rate the spillway adequacy of a dam are described in Appendix C. Since Lake Nessmuk Dam can pass the PMF, the spillway capacity is rated as adequate.

SECTION 6
STRUCTURAL STABILITY

6.1 Evaluation of Structural Stability.

a. Visual Observations.

(1) General. The visual inspection of Lake Nessmuk Dam, which is described in Section 3, resulted in a number of observations relevant to structural stability. These observations are evaluated herein for various features.

(2) Embankment. None of the observations noted in Section 3 are sufficiently serious to be considered a deficiency. The flow from the foundation drain outfalls is not considered a deficiency as it is minimal and indicates that the drains are functioning properly and that the impervious core and impervious cutoff are effective.

(3) Appurtenant Structures. There are no deficiencies at the main spillway riser. The spalling in the conduit is sufficiently minor that it is of no concern. A review of the data in the SCS files indicates that the as-built conduit can withstand a joint separation of at least 3 inches. The observed joint separations are therefore of no concern. The potential leaks from the outlet works gate are not a hazard to the dam, but the leaks could adversely affect normal operation. In view of the expense of replacing the gate, operating the gate at a reduced schedule appears to be warranted. When the gate is operated, and if it is opened sufficiently to slightly lower the pool, an opportunity is provided to inspect the conduit after the gate is closed.

b. Design and Construction Data. A stability analysis for the embankment was performed by the SCS during design. The stability analysis resulted in a minimum factor of safety of 1.45 on the upstream slope for the sudden drawdown condition and 1.50 on the downstream slope for the steady seepage condition. The design shear strength was determined from a triaxial

test of the consolidated-undrained condition. These factors of safety are considered to be adequate. A summary is included in Appendix A. After the analysis was completed, the downstream slope was flattened to 1V on 2.5H because it was felt that the soil conditions at the site might raise the phreatic surface in the embankment. A flattened slope improves the embankment stability.

c. Operating Records. There are no formal records of operation. There is no record of stability problems having occurred over the operational history of the dam.

d. Postconstruction Changes. There have been no postconstruction changes to Lake Nessmuk Dam.

e. Seismic Stability. Lake Nessmuk Dam is located in Seismic Zone 1. Normally it can be considered that if a dam in this zone has adequate factors of safety under static loading conditions, it can be assumed safe for any expected earthquake loading. Since the factors of safety are adequate, the dam is assumed to be stable for any expected earthquake loading.

SECTION 7

ASSESSMENT, RECOMMENDATIONS, AND PROPOSED REMEDIAL MEASURES

7.1 Dam Assessment.

a. Safety.

(1) Based on visual inspection, available records, calculations, and past operational performance, Lake Nessmuk Dam is judged to be in good condition. The spillway can pass the PMF without overtopping of the dam. The spillway capacity is rated as adequate.

(2) There is a stability analysis for the embankment, and it indicates that the embankment has adequate factors of safety. There is no evidence of problems threatening the embankment.

(3) The visual inspection revealed only one deficiency, which was the uncertain operational adequacy of the gate on the outlet works.

b. Adequacy of Information. The information available is such that an assessment of the condition of the dam can be inferred from the combination of visual inspection, past performance, and computations performed prior to and as part of this study.

c. Urgency. The recommendations in Paragraph 7.2 should be implemented without delay.

d. Necessity for Further Investigations. Accomplishment of the remedial measures outlined in Paragraph 7.2, will not require further investigations by the Owner.

7.2 Recommendations and Remedial Measures.

a. The following measure is recommended to be undertaken by the Owner without delay:

(1) Either repair the outlet works gate or adopt an operating policy such that the gate is maintained annually and operated every other year to ensure its operation in case of emergency. The gate should be operated as soon as possible.

b. In addition, it is recommended that the Owner modify his operational procedures as follows:

(1) Develop a detailed emergency operation and warning system for Lake Nessmuk Dam.

(2) When warnings of a storm of major proportions are given by the National Weather Service, the Owner should activate his emergency operation and warning system procedures.

SUSQUEHANNA RIVER BASIN
MORRIS BRANCH MARSH CREEK, TIOGA COUNTY
PENNSYLVANIA

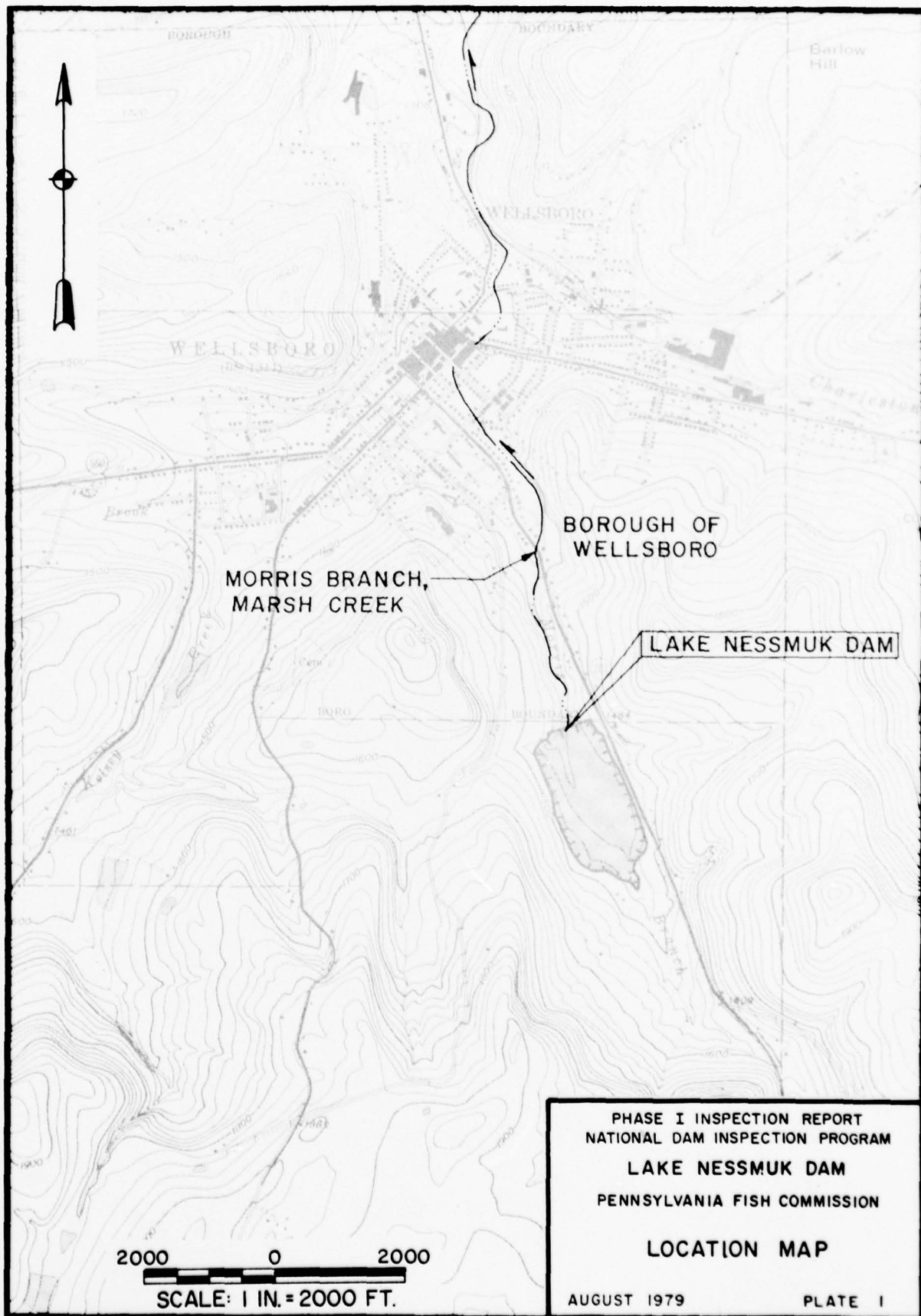
LAKE NESSMUK DAM

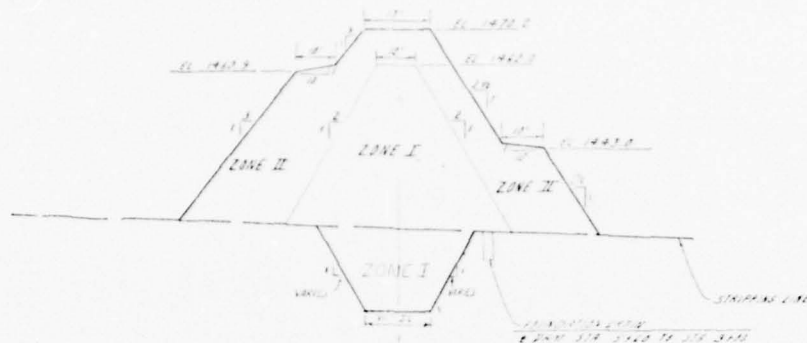
NDI ID No. PA-00032
DER ID No. 59-66
SCS ID No. PA-601

PENNSYLVANIA FISH COMMISSION
PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

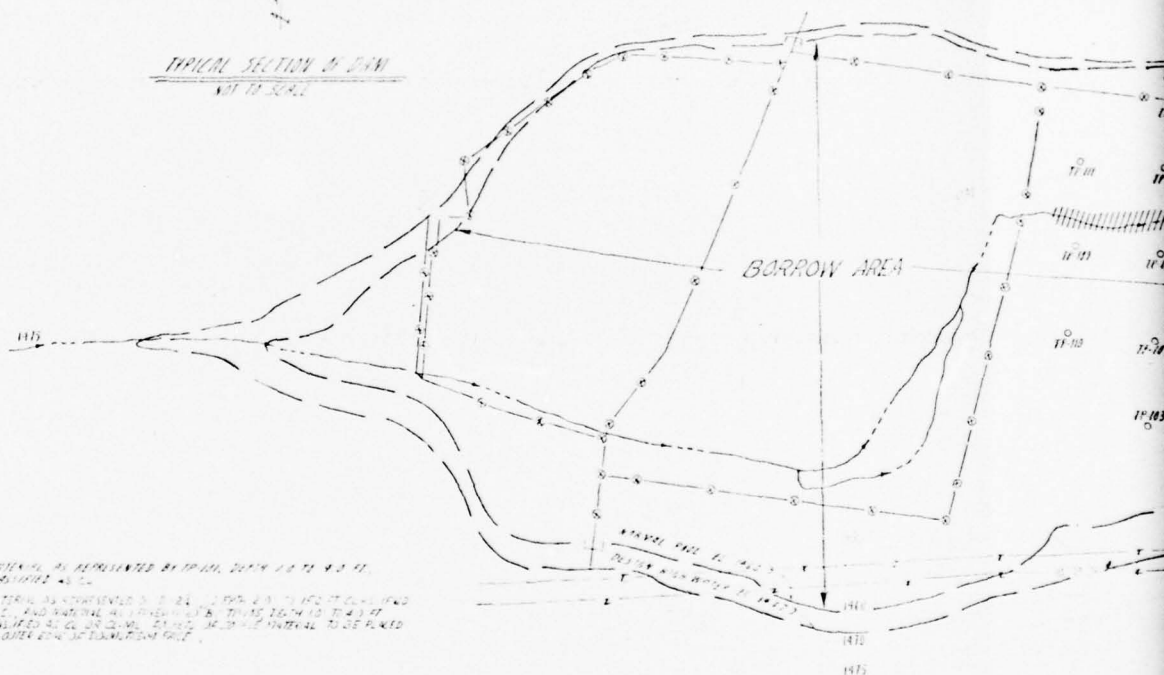
AUGUST 1979

PLATES





TYPICAL SECTION OF DAM
NOT TO SCALE



EXISTING FILL

ZONE I MATERIAL AS REPRESENTED BY TRIM, DITCH 10 TO 15 FT. DEPTH, 45%.

ZONE II MATERIAL AS REPRESENTED BY TRIM, DITCH 10 TO 15 FT. DEPTH, 45%.

COMPACTED SHALL BE CLASS B. THE FILL MATRIX SHALL BE COMPACTED TO AT LEAST 85 PERCENT OF THE MAXIMUM DENSITY OBTAINED IN COMPACTION TESTS OF THE FILL MATERIALS, FURNISHED BY METHOD A, ASTM D-693.

MAXIMUM LAYER THICKNESS IS 8" (BASIC COMPACTED)
MAXIMUM SIZE OF ROCK FRAGMENTS IS 6".

RESULTS OF MOISTURE-TENSITY TESTS (ASTM D-693, METHOD A) ON SAMPLES FROM INDICATED LOCATIONS

- ★ TP 101 - COMPACTED WAS AT LEAST 95% OPTIMUM DENSITY WITH MOISTURE CONTENT IN THE RANGE OF 13.5 TO 20.0%. OPTIMUM DENSITY WAS 109.5 PCF AT 17.5% MOISTURE CONTENT.
- ★ TP 105 - COMPACTED WAS AT LEAST 95% OPTIMUM DENSITY WITH MOISTURE CONTENT IN THE RANGE OF 11.0 TO 15.0%. OPTIMUM DENSITY WAS 118.5 PCF AT 12.5% MOISTURE CONTENT.
- ★ TP 202 - COMPACTED WAS AT LEAST 95% OPTIMUM DENSITY WITH MOISTURE CONTENT IN THE RANGE OF 8.2 TO 14.2%. OPTIMUM DENSITY WAS 120.5 PCF AT 11.0% MOISTURE CONTENT.

THE FINAL COMPACTED FILL SHALL BE IN THE MOISTURE RANGE ABOVE FOR THE TYPE OF MATERIAL USED.

See Sheets 12, 13 and 14 for Logs of Drill Holes and Test Pits.

AREA TO BE CLEARED AND GRADED 2.5 ACRES
 AREA TO BE CLEARED 2.3 ACRES
 FENCE NUMBER 2,122 1/4 FT.

RECORD
 REVISION
 DATE



LEGEND

- X-X- EXISTING FENCE
- [---] EXISTING FENCE SECTION TO BE REMOVED (CONSTRUCTION SPEC 3)
- POWER LINE
- TELEPHONE LINE
- TP TEST PIT

SCALE 0 100

MARSH CREEK
 MULTIPLE PURPOSE
 TIOGA COUNTY,
 PLAN OF SITE

U. S. DEPARTMENT OF
 SOIL CONSERVATION

DESIGNED BY *Joseph E. Thomas*
 DRAWN BY *C. CRISE*
 CHECKED BY *James M. Robinson*

JUN 7 1955

C. H. McConnell
Chief Engineer

27-0

WEEK WATERSHED
POSE DAM PA-601
TY, PENNSYLVANIA

STORAGE AREA

INT OF AGRICULTURE
RVATION SERVICE

Date
3-5-55
Approved by
P-65
PA-601-P

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

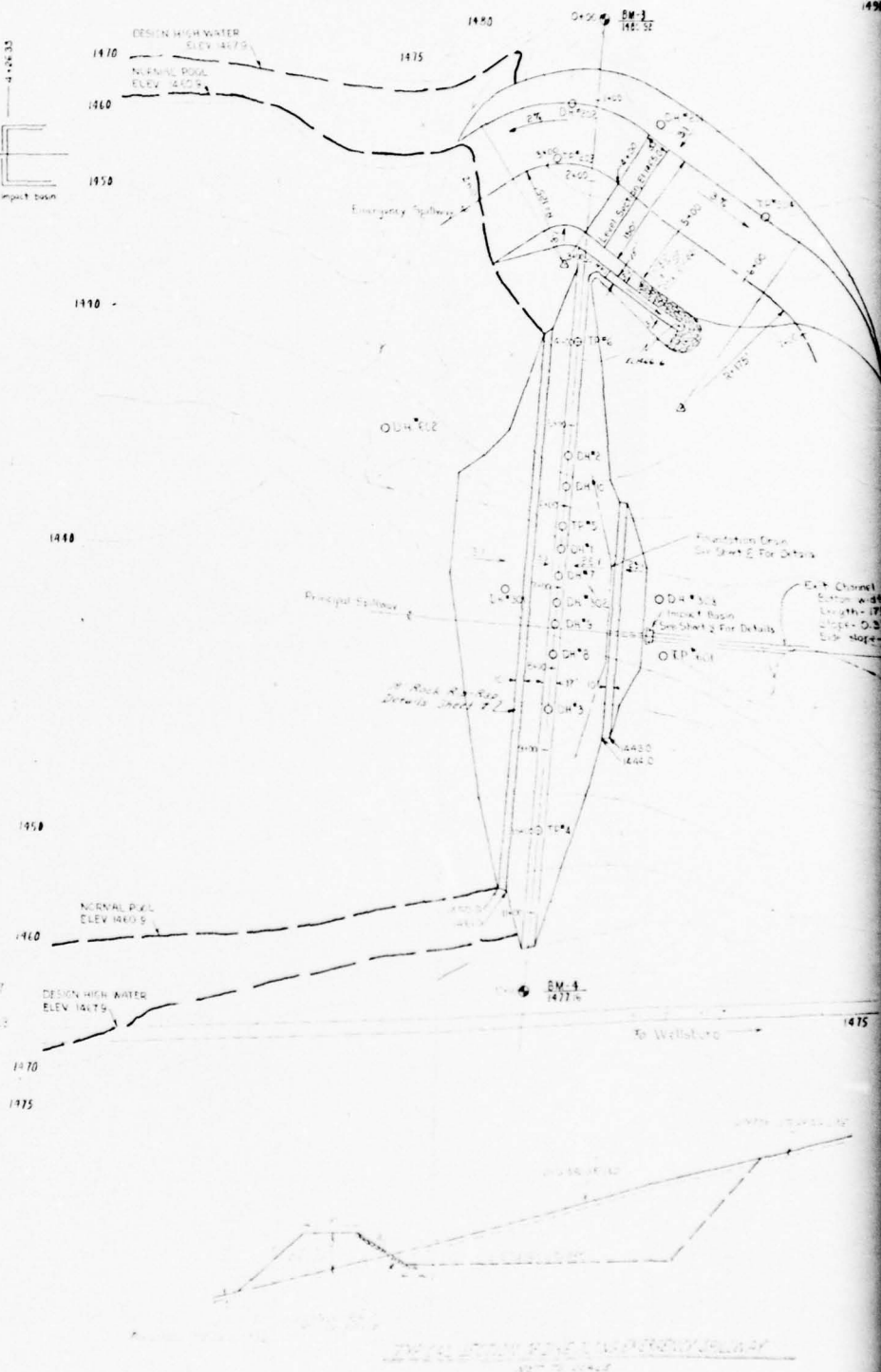
LAKE NESSMUK DAM

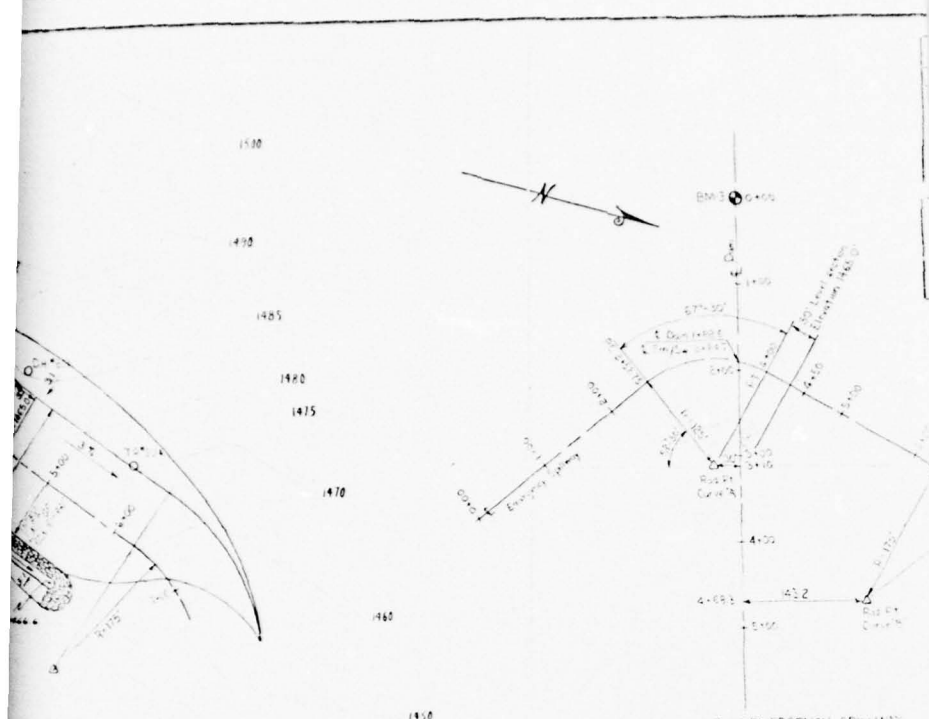
PENNSYLVANIA FISH COMMISSION

PLAN AND TYPICAL SECTION

AUGUST 1979

PLATE 2





LAYOUT OF EMERGENCY SPILLWAY
Not to Scale

EMERGENCY SPILLWAY & CURVE
Curve A

STATION	DEFLECTION	CHORD
2+52.75	0° 00'	—
2+67.48	3° 23'	14.72
2+82.20	6° 45'	14.72
2+96.93	10° 08'	14.72
3+11.65	13° 30'	14.72
3+26.38	16° 53'	14.72
3+41.10	20° 15'	14.72
3+55.83	23° 38'	14.72
3+70.55	27° 00'	14.72
3+85.28	30° 22'	14.72
4+00.00	33° 45'	14.72

EMERGENCY SPILLWAY & CURVE
Curve B

STATION	DEFLECTION	CHORD
6+30	0° 00'	—
6+42.02	2° 00'	12.22
6+54.44	4° 00'	12.22
6+66.66	6° 00'	12.22
6+78.88	8° 00'	12.22
6+91.10	10° 00'	12.22
7+03.32	12° 00'	12.22

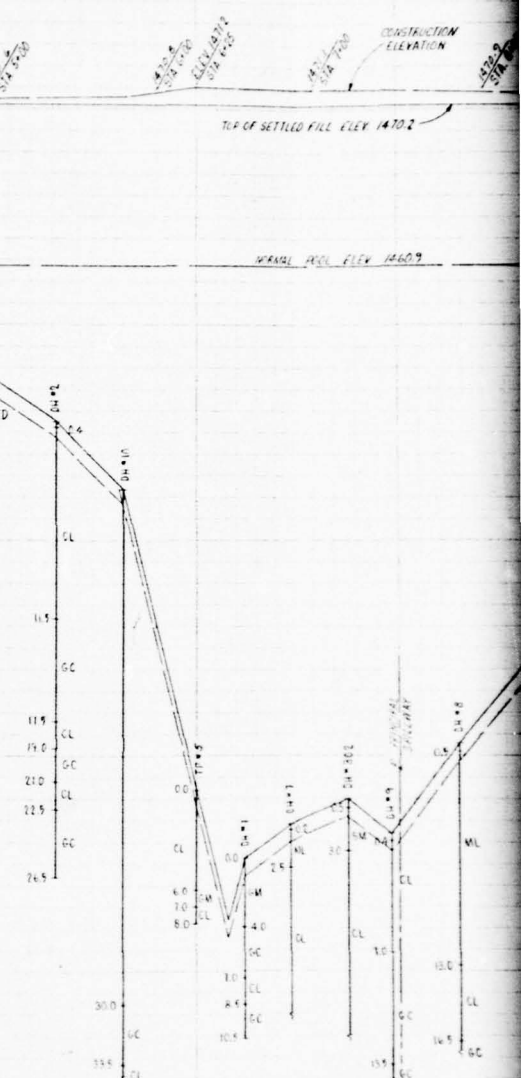
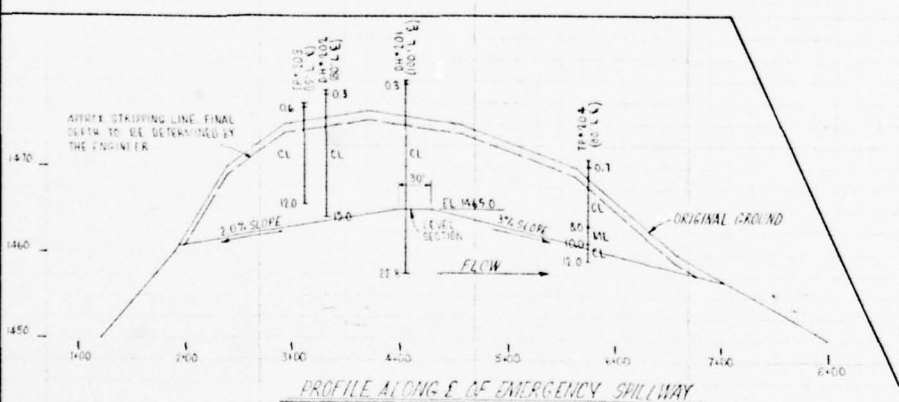
LEGEND
OTR - Soil Test Pit
ODH - Soil Drill Hole
Note: See sheets 2, 3 & 4 for logs of
Drill holes & Test Pits

SCALE 0 50

MARSH CRI
MULTIPLE FIVE
TIOGA COUNTY
PLAN C
U. S. DEPARTMENT
SOIL CONSERVATION

C. CRILE
D. SCHAFFNER

PLATE 3



PROFILE ALONG CENTERLINE OF DAM
LOOKING DOWNSTREAM

SEE SHEETS 12, 13 AND 14 FOR
LOGS OF DRILL HOLES AND TEST PITS

JUN 7 1966

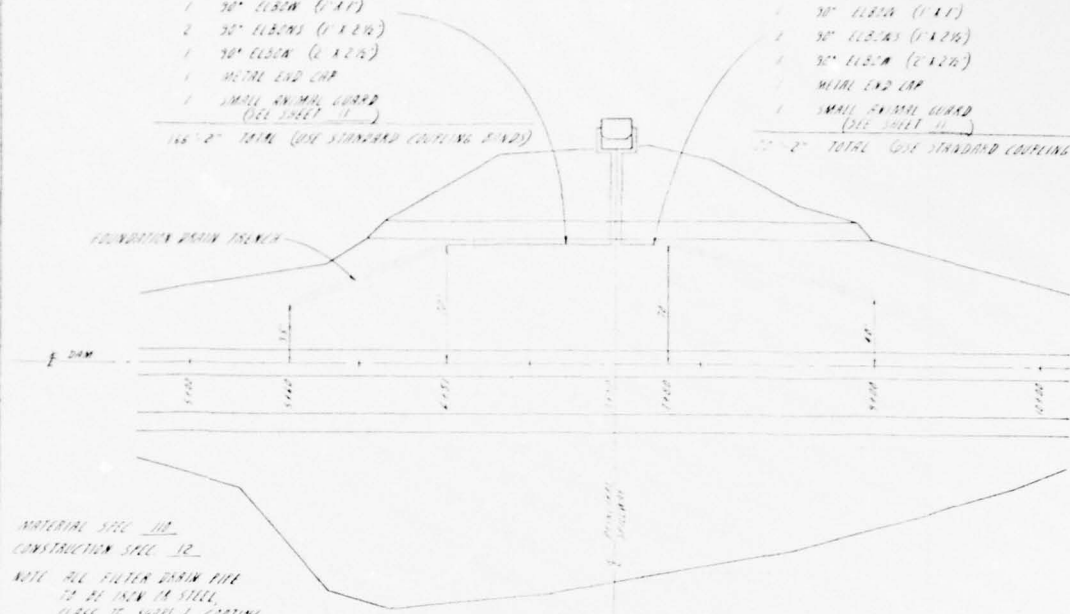
JUN 7 1966
C. H. ...
Chief Engineer

Date	Approved by
2-68	Tolson
A-65	Felt
2-70	Sullivan
4	FA - 601 - P

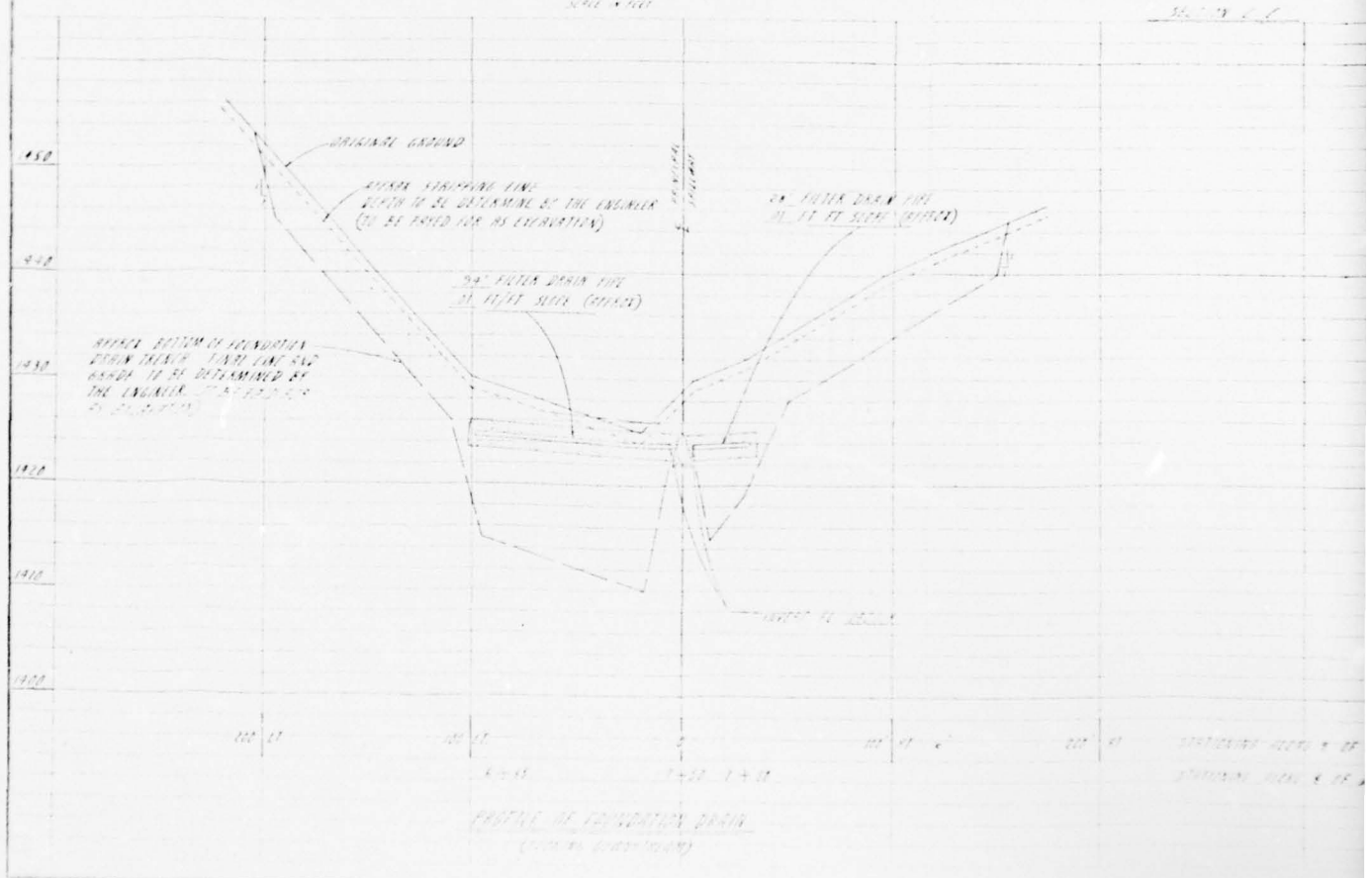
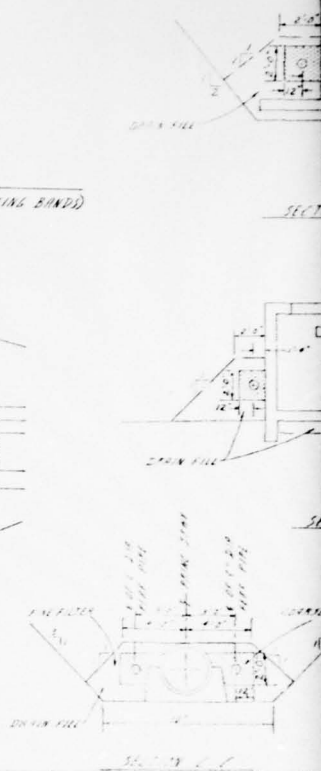
PLATE 4

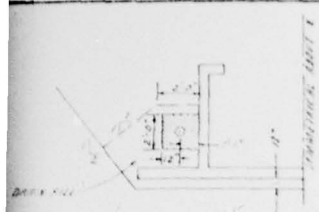
- 6" DIA. FILTER DRAIN PIPE (PERFORATED)
- 1 8' SECTION
 - 1 12' SECTION
 - 4 20' SECTIONS
 - 1 30" ELBOW (1' x 1')
 - 2 30" ELBOWS (1' x 2')
 - 1 30" ELBOW (2' x 2')
 - 1 METAL END CAP
 - 1 SMALL SWIMMER GROUND (SEE SHEET 11)
- 166'-2" TOTAL (USE STANDARD COUPLING BONDS)

- 6" DIA. FILTER DRAIN PIPE (PERFORATED)
- 1 8' SECTION
 - 1 12' SECTION
 - 3 14' SECTIONS
 - 1 30" ELBOW (1' x 1')
 - 2 30" ELBOWS (1' x 2')
 - 1 30" ELBOW (2' x 2')
 - 1 METAL END CAP
 - 1 SMALL SWIMMER GROUND (SEE SHEET 11)
- 122'-2" TOTAL (USE STANDARD COUPLING BONDS)

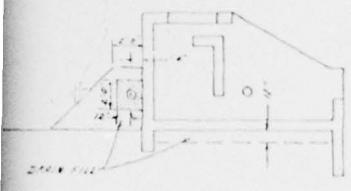


MATERIAL SPEC. 10.
CONSTRUCTION SPEC. 12.
NOTE: ALL FILTER DRAIN PIPE
12" IS INCH 12" STEEL,
CLASS 20, WALL 1, COATING
TYPE A, 16 GAUGE

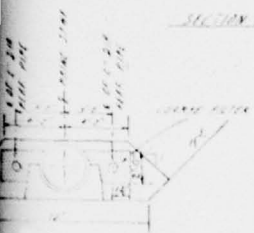




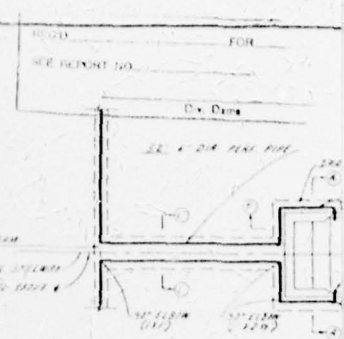
SECTION A-A



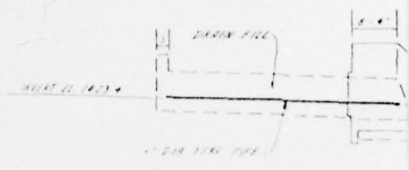
SECTION B-B



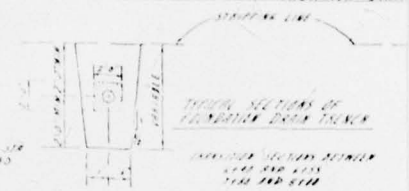
SECTION C-C



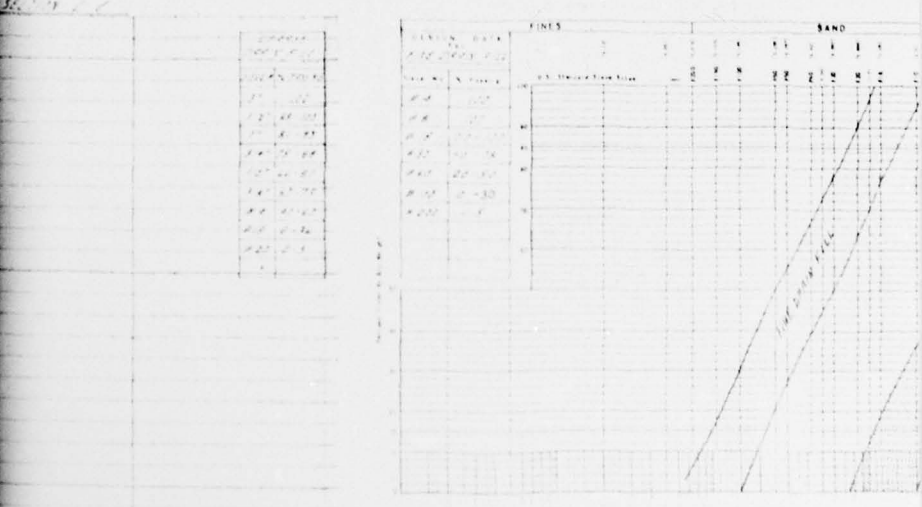
PLAN VIEW OF FOUNDATION DATA



TYPICAL SECTION ALONG FOUNDATION WALL



TYPICAL SECTION OF FOUNDATION DRAIN TRENCH



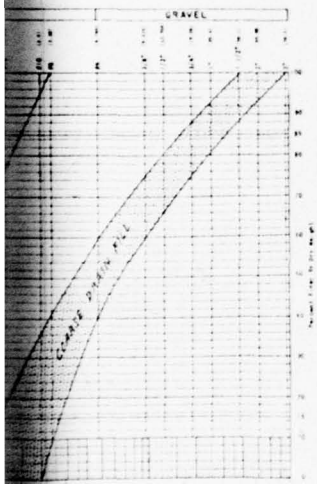
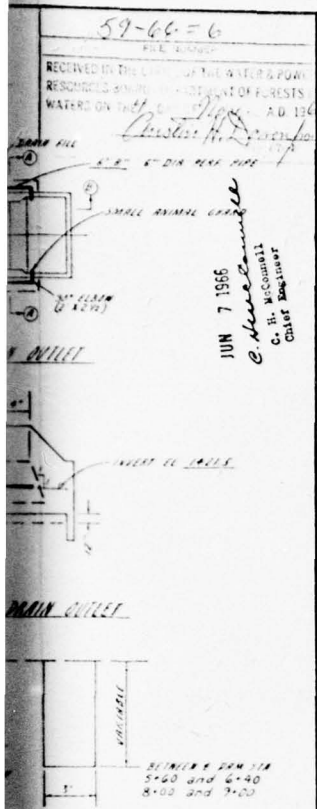
FOUNDATION LIMITS FOR DRAIN FILL

SECTIONING ALONG A OF TRENCH

SECTIONING ALONG A OF DAM

MARSH C
MULTIPLE PU
TIOGA COU
FOUNDATI
U.S. DEPARTM
SOIL CONST

J. H. Thomas
C. CRIDE
J. H. Thomas



(SPL 105)

CREEK WATERSHED
PURPOSE DAM PA-601
COUNTY, PENNSYLVANIA
ATION DRAIN DETAILS
TMENT OF AGRICULTURE
NSERVATION SERVICE

3'-60"

8'-65"

PA-601-P

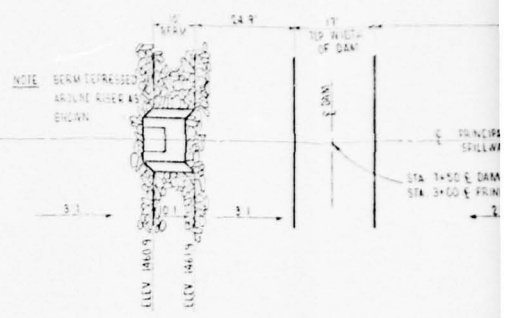
PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

LAKE NESSMUK DAM
PENNSYLVANIA FISH COMMISSION

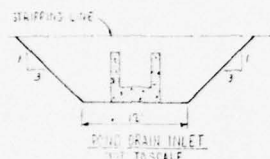
DRAIN PLAN

AUGUST 1979 PLATE 5

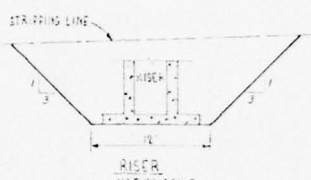
DISPOSAL AREA FOR ROCK
LARGER THAN 4" BAKED
FROM FILL. EXTENT TO
BE DETERMINED BY THE
ENGINEER.



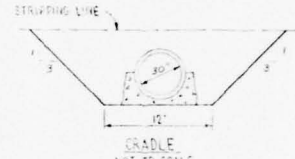
PLAN VIEW
NOT TO SCALE



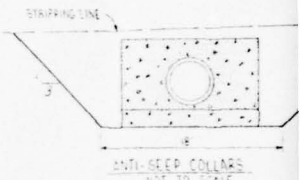
POUND DRAIN INLET
NOT TO SCALE



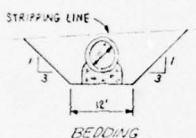
RISER
NOT TO SCALE



GRADE
NOT TO SCALE



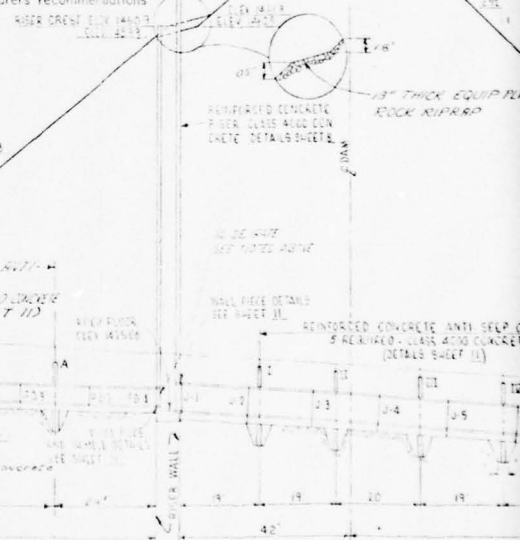
ANTI-SEEP COLLAR
NOT TO SCALE



BEDDING

SLIDE GATE NOTES

1. Slide gate - 18" dia, flat back, 10-40 minimum self-contained, i.e. weight of gate during opening and closing is taken by gate frame.
2. Non-rising stem - threaded portion bronze.
3. Fully adjustable stem guides.
4. Stem, stem guides and lift sized and spaced according to manufacturers' recommendations.



POUND DRAIN PIPE JOINT DATA

JOINT	DISTANCE FROM RIGER WALL	INVERT ELEV. OF 30" I.D. PRESSURE PIPE
PD 1	0.0	1428.50
PD 2	15.0	1428.58
PD 3	30.0	1428.67
PD 4	45.0	1428.75
PD 5	60.0	1428.85
PD 6	75.0	1428.94
PD 7	90.0	1429.02

POUND DRAIN ANTI-SEEP COLLAR DATA

COLLAR	DISTANCE FROM RIGER WALL	INVERT ELEV. OF 30" I.D. PRESSURE PIPE
A	24	1428.62
B	51	1428.77
C	75	1428.83

PRINCIPAL SPILLWAY ANTI-SEEP COLLAR DATA

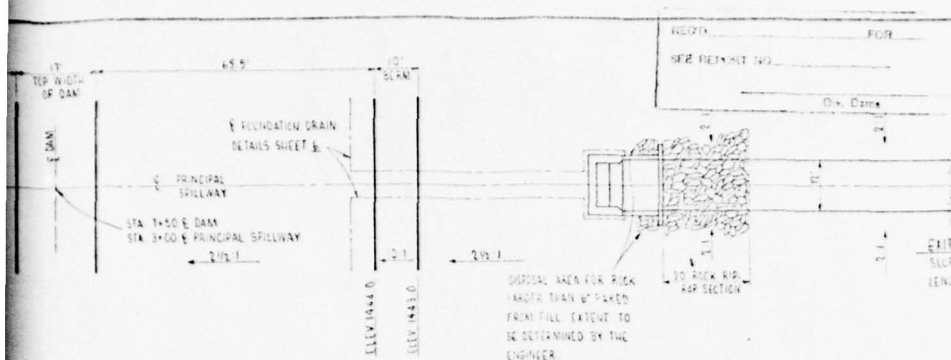
COLLAR	DISTANCE FROM RIGER WALL	INVERT ELEV. OF 30" I.D. PRESSURE PIPE
F	14	1424.64
G	39	1424.35
H	59	1424.00
I	71	1423.50
V	84	1422.78

NOTE: DIMENSIONS OF PIPE ARE BASED ON NOMINAL 1" AND DO NOT INCLUDE CREEP

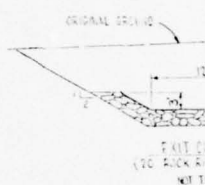
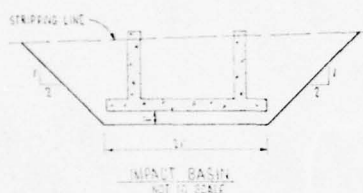
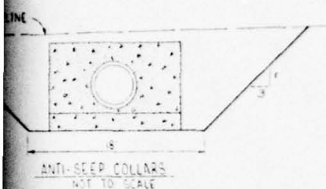
IN INSIDE OF REINFORCED CONCRETE PRESSURE PIPE IN 1" SECTIONS 1. WALL PIECE FOR 1" WALL

PRESSURE HEAD = 45
LOAD = 16,000 LBS PER LIN FT WALL IN 0.0 OF 24
MIN. 8 EDGE BEARING STRENGTH FOR
0.01 CRACK PRESTRESSED PIPE = 1,000 LBS PER LIN FT
0.01 CRACK PRESTRESSED PIPE = 1,000 LBS PER LIN FT

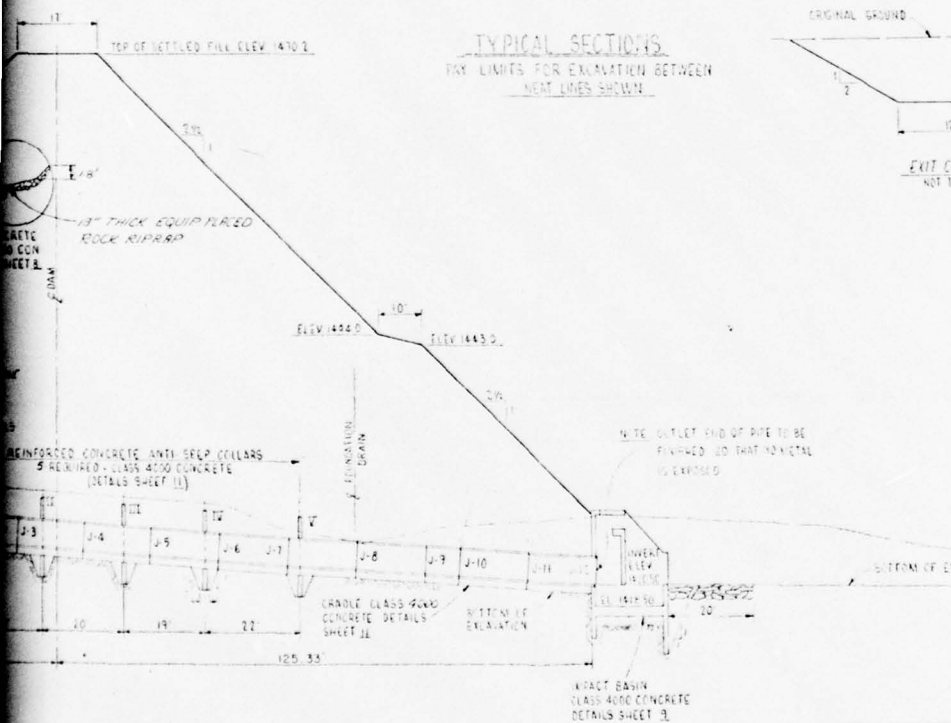
PROFILE ALONG E OF PRINCIPAL NOT TO SCALE



PLAN VIEW
NOT TO SCALE



TYPICAL SECTIONS
FOR LIMITS FOR EXCAVATION BETWEEN
NEXT LINES SHOWN



ALONG & OF PRINCIPAL SPILLWAY
NOT TO SCALE

30" DIAM. 100% REINFORCED CONCRETE PRESSURE PIPE
M - W SECTION
F - B SECTION
1.5' WALL PIECE FOR 10' WALL

PRESSURE HEAD +50'
LOAD = 32,600 LBS PER LIN. FT. BASED ON OD OF 36"
MIN. 5100 PSI TENSILE STRENGTH FOR
60,000 PSI CRACK NON-PRESTRESSED PIPE 2,272
LBS PER LIN. FT.
100% CRACK PRESTRESSED PIPE 2,492 LBS
PER LIN. FT.

MARSH (C)
MULTIPLE P
TIOGA CO
PLAN-PROFILE (C)
U. S. DEPART
SOIL CONS

R A STALTER

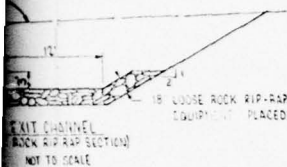
59-66-7

RECEIVED BY THE
 PENNSYLVANIA DEPARTMENT OF FORESTRY
 WAREHOUSING DIVISION
 JUN 10 1965
Arthur H. McConnell
 State Park

EXIT CHANNEL
 SLOPE 1:0.5 FT/H
 LENGTH 175 (APPROX)

JUN 7 1965

C. H. McConnell
 C. H. McConnell
 Chief Engineer



EXIT CHANNEL
 NOT TO SCALE

FOOT OF EXIT CHANNEL

RESH CREEK WATERSHED
 MULTIPLE PURPOSE DAM PA-601
 WYOMING COUNTY, PENNSYLVANIA
 FILE OF PRINCIPAL SPILLWAY
 DEPARTMENT OF AGRICULTURE
 CONSERVATION SERVICE

DATE 8-65
 BY Thomas S-10
 PA-601-P

SCS-313C (9-64)

PHASE I INSPECTION REPORT
 NATIONAL DAM INSPECTION PROGRAM

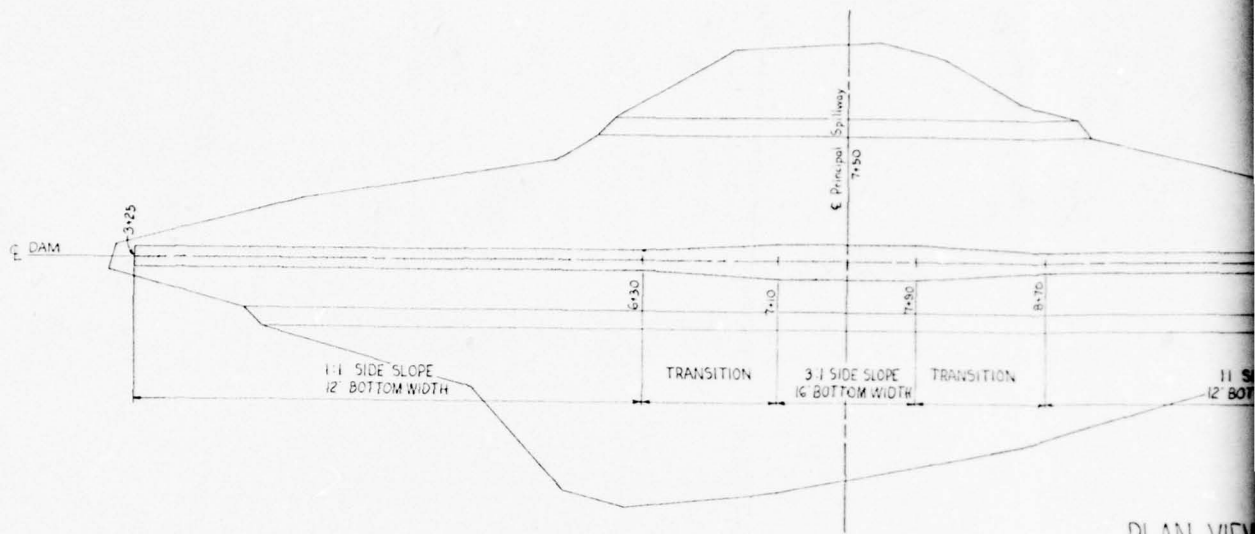
LAKE NESSMUK DAM

PENNSYLVANIA FISH COMMISSION

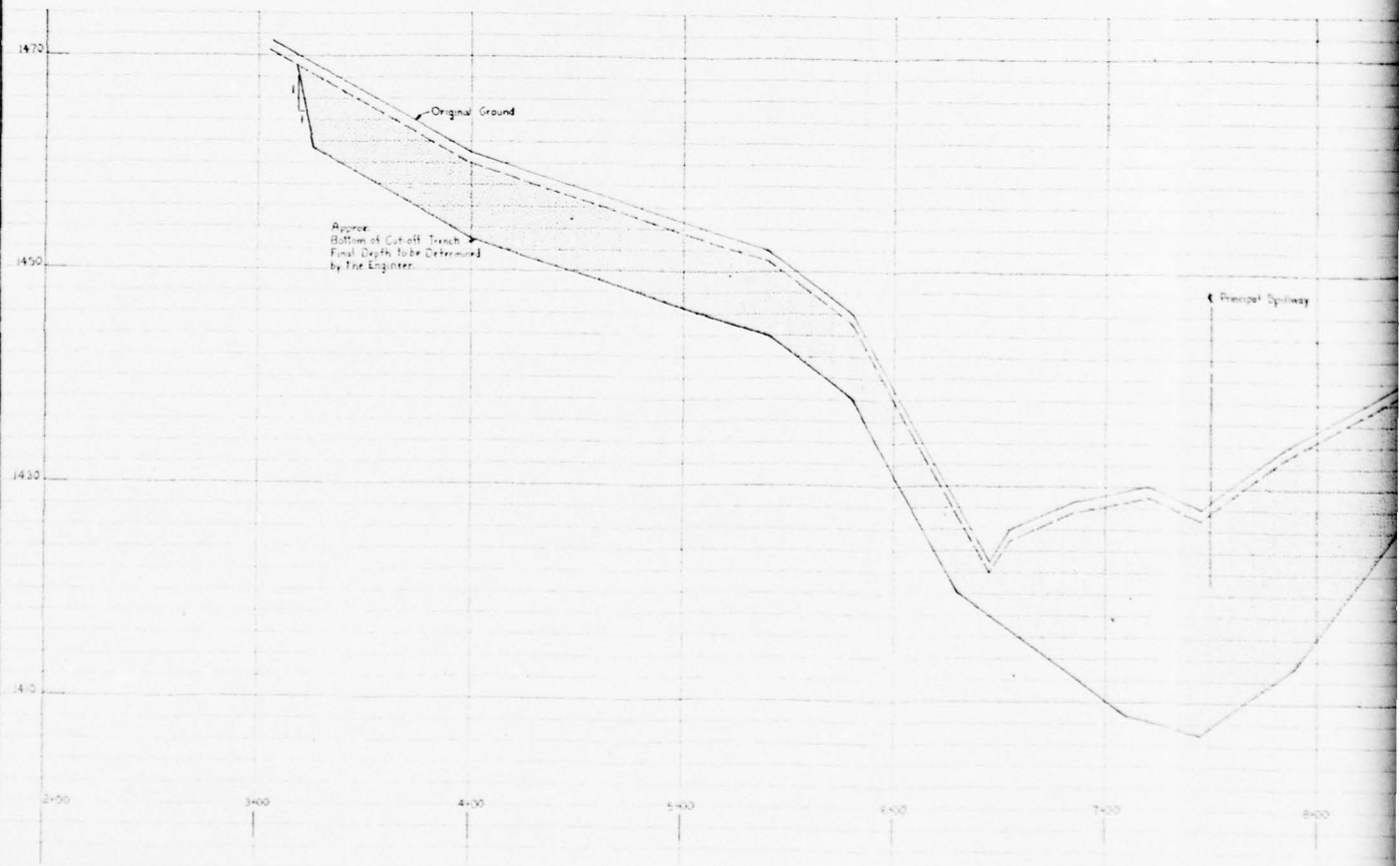
MAIN SPILLWAY
 AND OUTLET WORKS

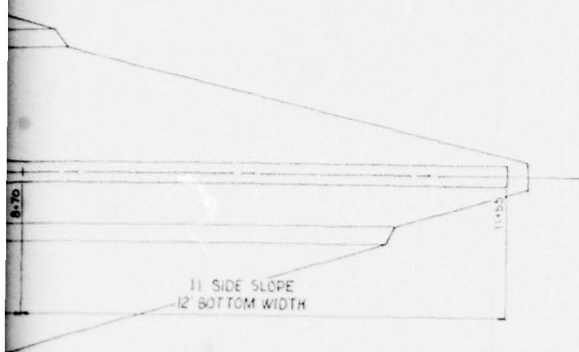
AUGUST 1979

PLATE 6

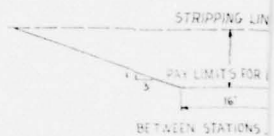
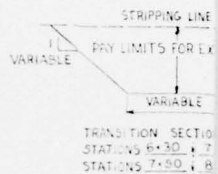
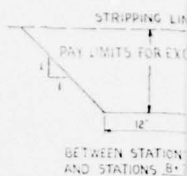
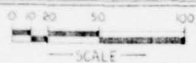


PLAN VIEW

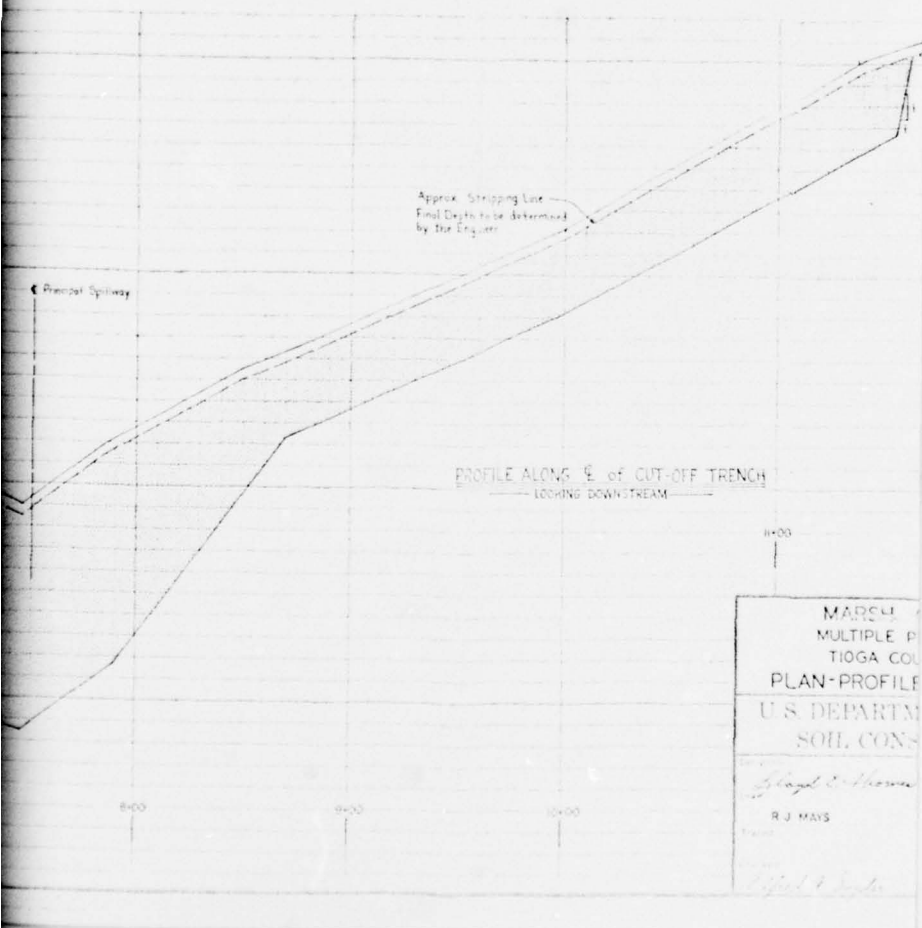




PLAN VIEW OF CUT-OFF TRENCH



TYPICAL SECTION OF CUT-OFF TRENCH



59-66-5

REVIEWED FOR THE DIRECTOR OF THE BUREAU OF REVENUE & CUSTOMS
SOURCE: BUREAU OF REVENUE & CUSTOMS, DEPARTMENT OF TREASURY
STATES ON THE 11th DAY OF 11/1966 AD 1965

IN
RECD FOR

SEE REPLY TO
2: 6:30
11:55

ION
VARIABLE

JUN 7 1966

C. H. McCullough
Chief Engineer

BETWEEN
AND

2: 7:30

IONS
TRENCH

GREEN WATERSHED
PROPOSED DAM PA-601
ITY, PENNSYLVANIA
OF CUT-OFF TRENCH
ENT OF AGRICULTURE
IRVATION SERVICE

2-1966
8-65
5
PA-601-P

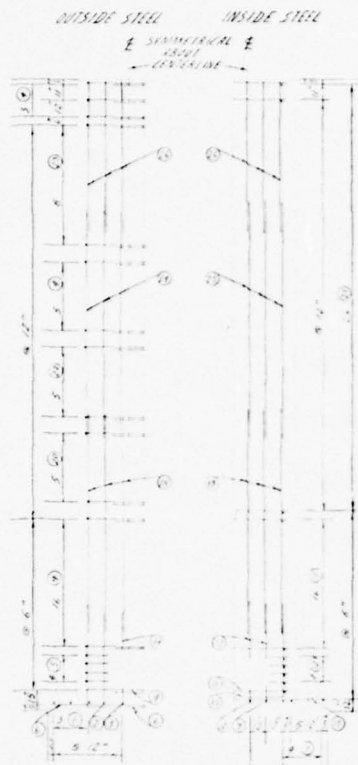
PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

LAKE NESSMUK DAM
PENNSYLVANIA FISH COMMISSION

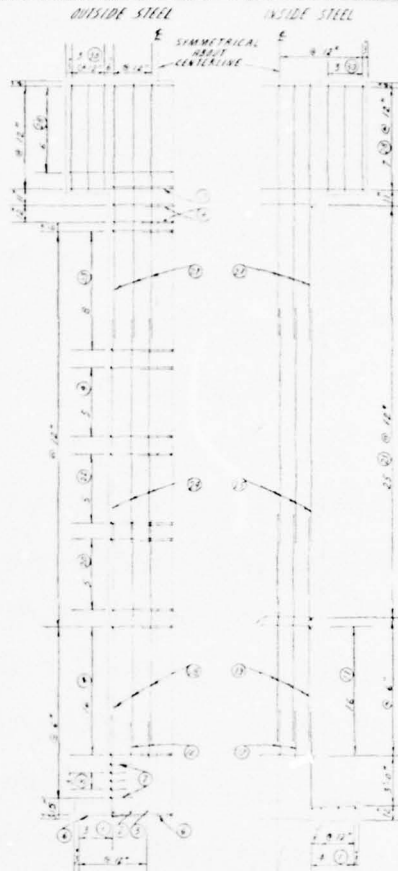
CUT-OFF TRENCH

AUGUST 1979

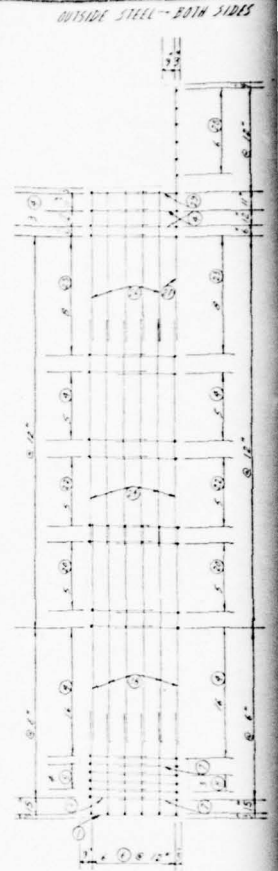
PLATE 7



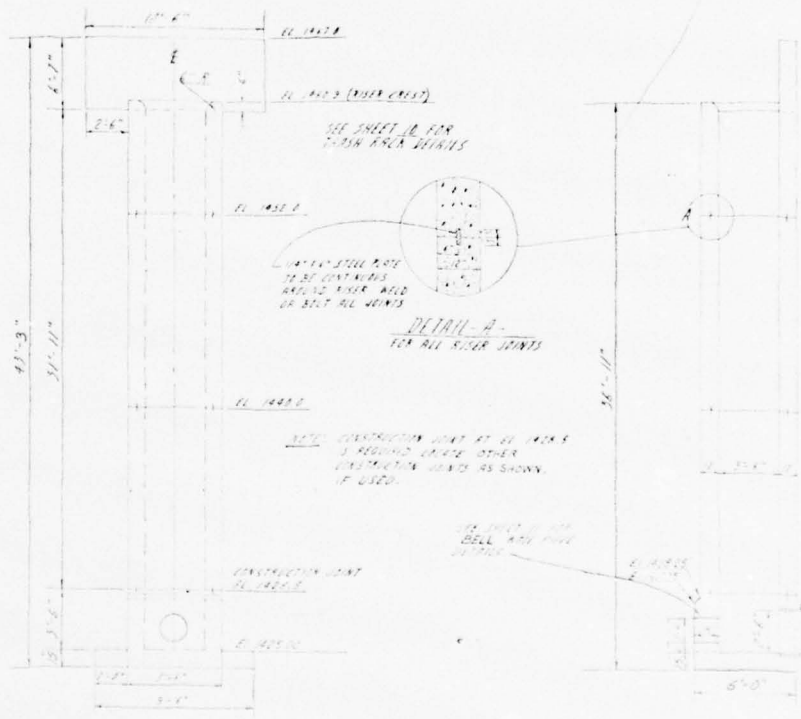
FRONT WALL



REAR WALL



SIDE WALL



FOUNDATION



SECTION A-A

STEEL - BOIN SIDES

INSIDE STEEL - BOIN SIDES

STEEL 3

59-44-6
FILE NO. 59-44-6
RECEIVED BY THE OFFICE OF THE WATER & POWER
RESOURCES BOARD, U. S. DEPARTMENT OF FORESTS &
WILDERNESS, MAY 10, 1960
AD 1960

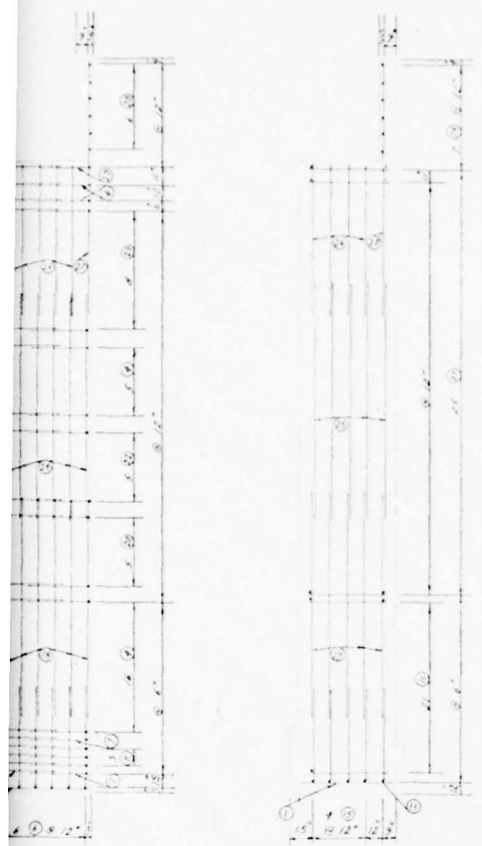
FOR
DIV. OF
USE SHEET
FOR COLLAR DETAIL

NO.	LOCATION	NO.	SIZE	LENG.
1	RISER	19	4	5'-0"
2		2	5	10'-1"
3		2	5	6'-1"
4		24	5	4'-5"
5		8	5	4'-7"
6		12	7	15'-8"
7		4	5	4'-7"
8		6	5	4'-4"
9		2	5	4'-5"
10		1	5	4'-2"
11		15	4	4'-2"
12		8	4	2'-5"
13		2	5	7'-10"
14		2	4	2'-4"
15		8	5	11'-1"
16		4	4	2'-4"
17		10	5	3'-2"
18		20	4	12'-5"
19		4	5	13'-2"
20		20	7	3'-6"
21		103	5	4'-1"
22		10	4	7'-1"
23		12	4	4'-5"
24		20	4	13'-1"
25		14	5	13'-1"
26		25	5	8'-1"
27		11	5	13'-1"
28		15	5	10'-1"
29		2	5	10'-1"
30		12	5	4'-1"
31	END OF COL.	40	4	3'-1"
32		10	4	3'-1"
33		25	4	12'-1"
34		30	4	11'-1"
35		25	4	2'-1"
36		10	4	3'-1"
37		10	4	3'-1"
38		10	4	3'-1"
39		12	4	1'-3"
40		12	4	1'-3"

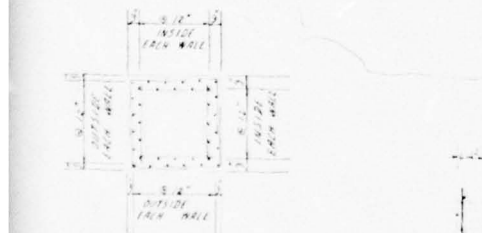
1 BAR

STEEL CURB
NO. 4 BARS 233.00 FT
NO. 5 BARS 236.00 FT
NO. 6 BARS 140.00 FT
NO. 7 BARS 34.00 FT
TOTAL

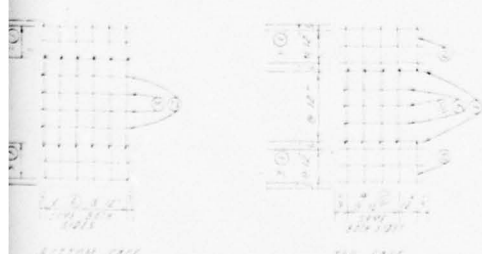
CONCRETE CURB
CLASS AND 100 LB



INSIDE WALL SIDE WALL



SECTION THROUGH END OF CURB



BOTTOM FACE TOP FACE

4 @ Bars

POND DRAW DEIVING

See Sheet 11 for General
NOTE TO ARCHITECT

MARSH CREEK
MULTIPLE PURPOSE
TIOGA COUNTY,
STRUCTURAL

U. S. DEPARTMENT
SOIL CONSERVATION

BY
C. E. ROBERTSON
C. CRUSE

DATE
11-64
8-65

OW TYPE	A	B	TOTAL	FLEET
7 th	1			72.25
8 th	2	5'-0"	5'-9"	21.50
9 th	2	5'-0"	1'-11"	12.12
1 st	2	3'-6"	3'-0"	682.28
2 nd	2	3'-0"	3'-0"	74.67
3 rd	2	3'-0"	6'-0"	164.00
4 th	2	3'-0"	1'-0"	18.33
5 th	2	3'-0"	1'-0"	24.08
6 th	2	3'-0"	3'-0"	8.52
7 th	2	3'-0"	3'-0"	9.05
8 th	1			312.50
9 th	1			6.25
10 th	2	5'-5"	2'-6"	15.83
11 th	1			4.47
12 th	2	6'-6"	5'-0"	35.33
13 th	1			12.12
14 th	1			31.47
15 th	2			255.14
16 th	2			210.47
17 th	2	3'-0"	3'-0"	152.02
18 th	2			429.17
19 th	2	3'-0"	3'-0"	144.25
20 th	2	3'-0"	3'-0"	602.67
21 st	1			265.28
22 nd	1			218.67
23 rd	1			216.47
24 th	1			151.25
25 th	1			130.52
26 th	1	3'-0"	3'-0"	21.47
27 th	1			73.08
28 th	1			250.50
29 th	1			164.67
30 th	1			312.50
31 st	1			45.12
32 nd	1			25.52
33 rd	1			24.75
34 th	1			66.00
35 th	1			110.02
36 th	1			15.52
37 th	1			20.00

7775
7875
 88 COLLARS
159720 LBS
246131 BS
210221 BS
49182 LBS
 49 73 LBS

QUANTITIES

20 PDS (RISER ONLY)

JUN 7 1966

C. H. McConnell
Chief Engineer

Notes

K WATERSHED
 E DAM PA-601
 . PENNSYLVANIA
 AL DETAILS
 T OF AGRICULTURE
 TION SERVICE

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

LAKE NESSMUK DAM

PENNSYLVANIA FISH COMMISSION

MAIN SPILLWAY RISER

AUGUST 1979

PLATE 8

SUSQUEHANNA RIVER BASIN
MORRIS BRANCH MARSH CREEK, TIOGA COUNTY
PENNSYLVANIA

LAKE NESSMUK DAM

NDI ID No. PA-00032
DER ID No. 59-66
SCS ID No. PA-601

PENNSYLVANIA FISH COMMISSION
PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

AUGUST 1979

APPENDIX A
CHECKLIST - ENGINEERING DATA

CHECKLIST

ENGINEERING DATA
DESIGN, CONSTRUCTION, AND OPERATION
PHASE INAME OF DAM: LAKE NESSEMMUKNDI ID NO.: PA-00169 DER ID NO.: 59-66SCS ID NO. PA-601Sheet 1 of 4

ITEM	REMARKS
AS-BUILT DRAWINGS	AVAILABLE IN SCS FILES
REGIONAL VICINITY MAP	SEE PLATE 1
CONSTRUCTION HISTORY	BUILT 1967-1968
TYPICAL SECTIONS OF DAM	SEE PLATE 2
OUTLETS: Plan Details Constraints Discharge Ratings	SEE PLATE 6 NO RATINGS AVAILABLE

A-1

ENGINEERING DATA

Sheet 2 of 4

ITEM	REMARKS
RAINFALL/RESERVOIR RECORDS	NONE
DESIGN REPORTS	AVAILABLE IN SCS FILES
GEOLOGY REPORTS	AVAILABLE IN SCS FILES
DESIGN COMPUTATIONS: Hydrology and Hydraulics Dam Stability Seepage Studies	ALL EXCEPT SEEPAGE STUDY AVAILABLE. SEE END OF APPENDIX A AND APPENDIX C.
MATERIALS INVESTIGATIONS: Boring Records Laboratory Field	ALL AVAILABLE IN SCS FILES
POSTCONSTRUCTION SURVEYS OF DAM	NONE

A-2

ENGINEERING DATA

Sheet 3 of 4

ITEM	REMARKS
BORROW SOURCES	FROM SITE AS NOTED ON DRAWINGS
MONITORING SYSTEMS	NONE
MODIFICATIONS	NONE
HIGH POOL RECORDS	NO FORMAL RECORDS. HIGHEST POOL REPORTED: AGNES 8" below Aux. Spillway Crest, Tropical Storm
POSTCONSTRUCTION ENGINEERING STUDIES AND REPORTS	NONE
PRIOR ACCIDENTS OR FAILURE OF DAM: Description Reports	NONE

ENGINEERING DATA

Sheet 4 of 4

ITEM	REMARKS
MAINTENANCE AND OPERATION RECORDS	None
SPILLWAY: Plan Sections Details	See Plate 6 and 8
OPERATING EQUIPMENT: Plans Details	Available in SCS Files
PREVIOUS INSPECTIONS Dates Deficiencies	1970 - GATE LEAKING 1971 - NO DEFICIENCIES 1972 - Debris AT MAIN SPILLWAY 1974 - NO DEFICIENCIES 1977 - NO DEFICIENCIES 1978 - NO DEFICIENCIES, NOTES GATE WAS NOT OPERATED.

A-4

To be used to report to field offices data used for slope stability analyses and the results of the analyses. The right side of the form will be used for a sketch of the embankment on which the analyses have been made.

10-58

SOIL MECHANICS LABORATORY

Maximum Section

SUMMARY - SLOPE STABILITY ANALYSIS

State PENNSYLVANIA Project MARSH CREEK SITE #PA 601

Date 12-11-64 Analysis Made By A.W.L. Checked By G.N.G.

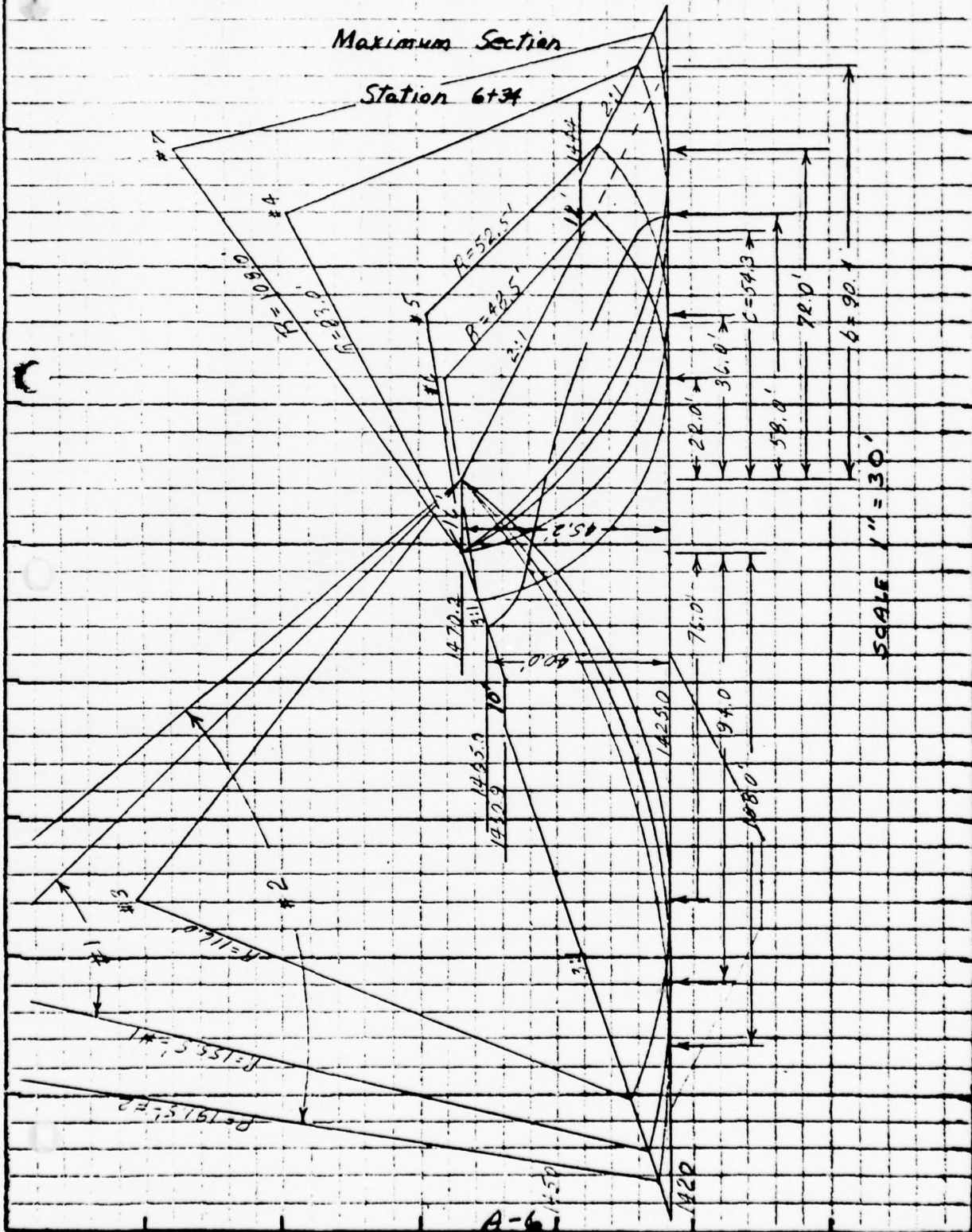
Method of Analysis SWEDISH CIRCLE

Location of Material							Emb 95% Std CL		Emb 95% Std CL	
Sample No.							95W1066		65W1067	
τ_d							114.4		103.6	
τ_m							128.0		121.5	
τ_s							134.0		127.0	
τ_b							71.5		64.5	
Condition	Opt.	Sat.	Opt.	Sat.	Opt.	Sat.	Opt.	Sat.	Opt.	Sat.
ϕ								22.5°		16.0°
Tan ϕ								0.414		0.287
K										
C								350		900

UPSTREAM SLOPE			
Trial	Slope	Conditions	Fs
1	3:1	Full draw down - 10' berm @ elev. 1460.9 - Arc cut from app. shldr thru Emb (22.5°-350) only	1.45
1A	3:1	Same as #1 except Emb (16.0°-900) only	2.2
2	3:1	Full draw down - 10' berm @ elev. 1410.9 - Arc cut from app. shldr thru Emb (22.5°-350) only	1.50
3	3:1	Full draw down - 10' berm @ elev. 1460.9 - Arc cut from app. shldr thru Emb (22.5°-350) only	1.54

DOWNSTREAM SLOPE			
Trial	Slope	Conditions	Fs
4	2:1	Drain @ 9% = 0.6 - No berm - Arc cut from app. shldr thru Emb (22.5°-350) only	1.32
4A	2:1	Same as #4 except Emb (16.0°-900) only	1.89
4B	2:1	Same as #4 except 12' berm @ elev. 1444	1.50
5	2:1	Drain @ 9% = 0.6 - No berm - Arc cut from app. shldr thru Emb (22.5°-350) only	1.47
6	2:1	Drain @ 9% = 0.6 - No berm - Arc cut from app. shldr thru Emb (22.5°-350) only	1.80
7	2:1	Drain @ 9% = 0.6 - 12' berm @ elev. 1444 - Arc cut from app. shldr thru emb of (22.5°-350) only.	1.54
		A 5.5	

Continuation of Sheet 1 of 2
Marsh Creek Site PA601
Pennsylvania



Scale 1 inch = 30 Feet

SUSQUEHANNA RIVER BASIN
MORRIS BRANCH MARSH CREEK, TIOGA COUNTY
PENNSYLVANIA

LAKE NESSMUK DAM

NDI ID No. PA-00032
DER ID No. 59-66
SCS ID No. PA-601

PENNSYLVANIA FISH COMMISSION
PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

AUGUST 1979

APPENDIX B
CHECKLIST - VISUAL INSPECTION

CHECKLIST

VISUAL INSPECTION

PHASE I

Name of Dam: LAKE NESSMUK County: TIOGA State: PENNSYLVANIA
NDI ID No.: PA-00169 DER ID No.: 59-66
Type of Dam: ZONED EARTHILL Hazard Category: HIGH
Date(s) Inspection: 26 & 27 JULY 1979 Weather: Hazy-see below Temperature: 75°F
SOIL: VERY MOIST - INSPECTION INTERRUPTED BY THUNDER SHOWER
SCS ID. NO: PA-601
Pool Elevation at Time of Inspection: _____ msl/Tailwater at Time of Inspection: _____ msl

Inspection Personnel:

E. JON GRINDALL (PFC) HOWARD RUTLEDGE (SCS) D. EBERSOLE (GFCC)
DAN O'NEILL (PFC) JOHN ZAGINAYLO (SCS)
RON WOODHEAD (BOROUGH) D. WOLF (GFCC)
A. WHITMAN (GFCC) Recorder

B-1

EMBANKMENT

Sheet 1 of 2

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS	NONE	
UNUSUAL MOVEMENT OR CRACKING AT OR BEYOND THE TOE	NONE	
SLOUGHING OR EROSION: Embankment Slopes Abutment Slopes	MINOR SCALPING OF GRASS COVER, PROBABLY BY MOWING. NO EROSION EVIDENT.	
CREST ALIGNMENT: Vertical Horizontal	VERTICAL - SEE SURVEY SHEETS FOLLOWING INSPECTION FORMS HORIZONTAL - NO DEFICIENCIES	
RIPRAP FAILURES	RIPRAP IN GOOD CONDITION, IT EXTENDS APPROXIMATELY 2.8 FEET ABOVE MAIN SPILLWAY CREST	SOME AREAS ON THE UPSTREAM SLOPE RIPRAP ARE POORLY GRADED, BUT NOT SERIOUSLY.

B-2

EMBANKMENT

Sheet 2 of 2

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
JUNCTION OF EMBANKMENT WITH: Abutment Spillway Other Features	No deficiencies	
ANY NOTICEABLE SEEPAGE	NONE OBSERVED	
STAFF GAGE AND RECORDER	NONE AT SITE	
DRAINS	AT IMPACT BASIN LEFT DRAIN - 0.5 gpm FLOW RIGHT DRAIN - SMALL TRICKLE	
VEGETATION	GRASS - EXCEPT AS NOTED UNDER EROSION - GOOD DOWNSTREAM SLOPE IS COVERED WITH 2' TO 3' HIGH CROWN VETCH.	HIGH GRASS GROWING THROUGH RIPRAP ON UPSTREAM SLOPE, BEING CUT ON DAY OF INSPECTION. GRASS AT DAM WAS NEWLY GRADED.

B-3

OUTLET WORKS

Sheet 1 of 1

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CRACKING AND SPALLING OF CONCRETE SURFACES IN OUTLET CONDUIT	<p>few MINOR SPALLING AT EACH JOINT</p> <p>JOINT SEPARATION: $\frac{1}{4}$" TO $\frac{1}{2}$" EXCEPT 2 AT DOWNSTREAM END OPEN $\frac{3}{4}$ TO 1" AND 4TH FROM</p>	<p>NO EVIDENCE OF CAVITATION AT RISER.</p> <p>UPSTREAM END OPEN $\frac{1}{4}$"</p>
INTAKE STRUCTURE	Submerged	
OUTLET STRUCTURE	Impact basin - good condition.	
OUTLET CHANNEL	Riprap - good condition Minor brush on channel banks.	Brush not a deficiency. Broom maintenance personnel indicated it would be cut shortly.
EMERGENCY GATE	SCS personnel reported that gate had not been opened since construction. They were confident that the gate was operable, but did not wish	It to be opened because the gate does not seat correctly, which results in leakage and possible slow pool drawdown. Stopping leak requires adjusting wedges.

MAIN
GATED SPILLWAY

Sheet 1 of 1

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE WEIR	No deterioration	
APPROACH CHANNEL	Reservoir	
DISCHARGE CHANNEL	CONDUIT: SEE OUTLET WORKS	
BRIDGE AND PIERS	NONE	TRASH DEVICE AT CREST.

B-5

ANALYSIS/ ~~CHIEF~~ SPILLWAY

Sheet 1 of 1

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE SILL	NONE - GRACEFUL LEVEL SECTION	GOOD CONDITION
APPROACH CHANNEL	GRACEFUL SLOPE TO RESERVOIR	GOOD CONDITION
DISCHARGE CHANNEL	MINOR BRUSH IN RIPRAP AT RIGHT BANK	No deficiencies
BRIDGE AND PILES	NONE	
GATES AND OPERATION EQUIPMENT	NONE	

INSTRUMENTATION

Sheet 1 of 1

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
MONUMENTATION/SURVEYS	NONE AT SITE	
OBSERVATION WELLS	NONE AT SITE	
WEIRS	NONE AT SITE	
PIEZOMETERS	NONE AT SITE	
OTHER	N/A	

DOWNSTREAM CHANNEL

Sheet 1 of 1

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONDITION: Obstructions Debris Other	No obstructions or significant debris. Minor brush on banks.	BRUSH CUTTING IN PROGRESS
SLOPES	STEEP STREAM BANKS GENTLE SLOPE OVBANKS	
APPROXIMATE NUMBER OF HOMES AND POPULATION	GREATLY IN EXCESS OF 50 dwellings, ALSO COMMERCIAL DISTRICT	STREAM FLOWS THROUGH BOROUGH OF WELLSBORO IN SMALL VERTICAL-SIDE CHANNEL

RESERVOIR AND WATERSHED

Sheet 1 of 1

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SLOPES	GRASSY TO STEEP	
SEDIMENTATION	NO OBSERVED OR REPORTED PROBLEMS	
WATERSHED DESCRIPTION	ROLLING HILLS EITHER WOODS OR FARM FIELDS. VERY MINOR development	

GANNETT FLEMING CORDRY
AND CARPENTER, INC.
HARRISBURG, PA.

SUBJECT PA-NO. 601 DAM

FILE NO. _____

SHEET NO. _____ OF _____ SHEETS

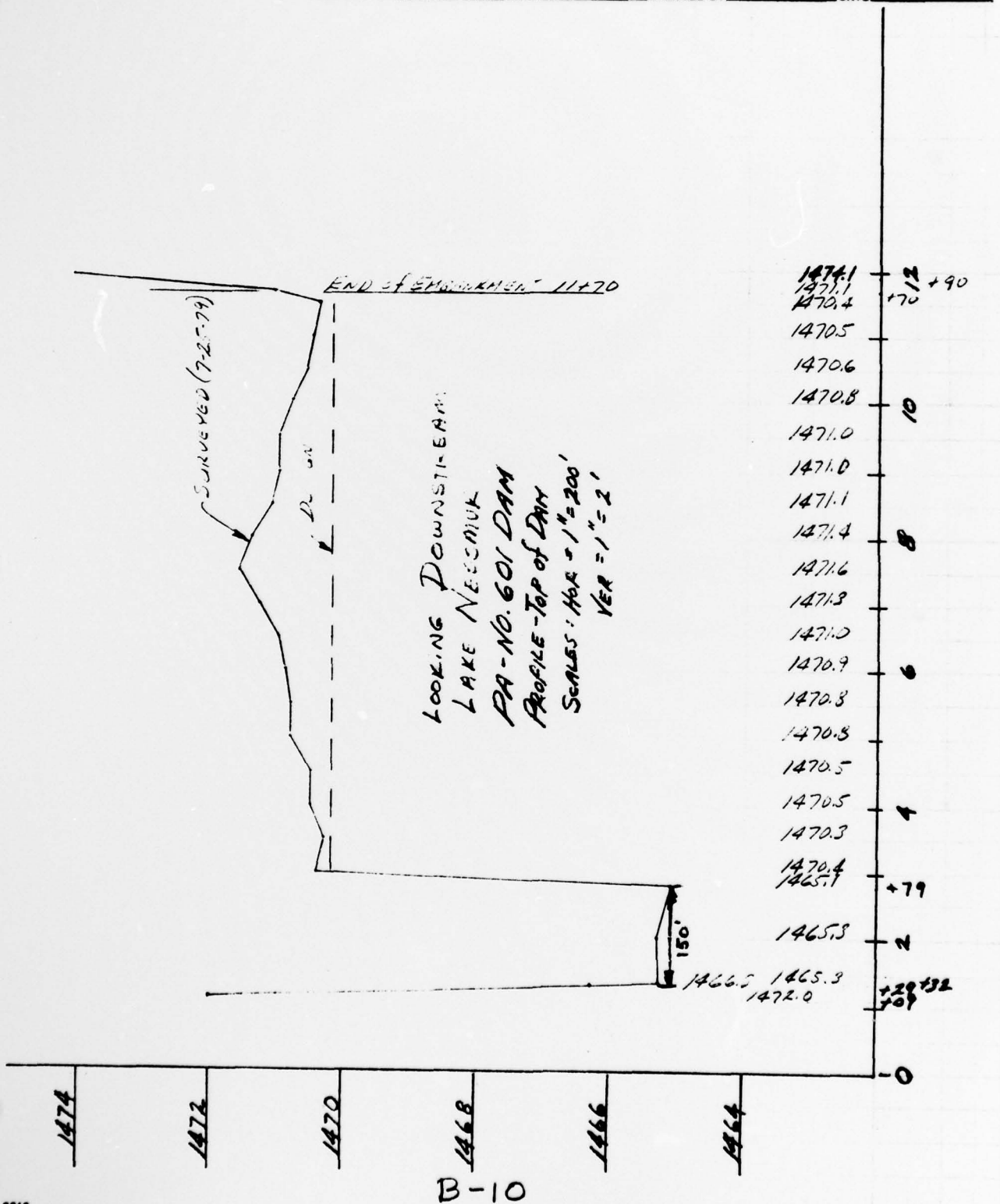
FOR _____

COMPUTED BY _____

DATE _____

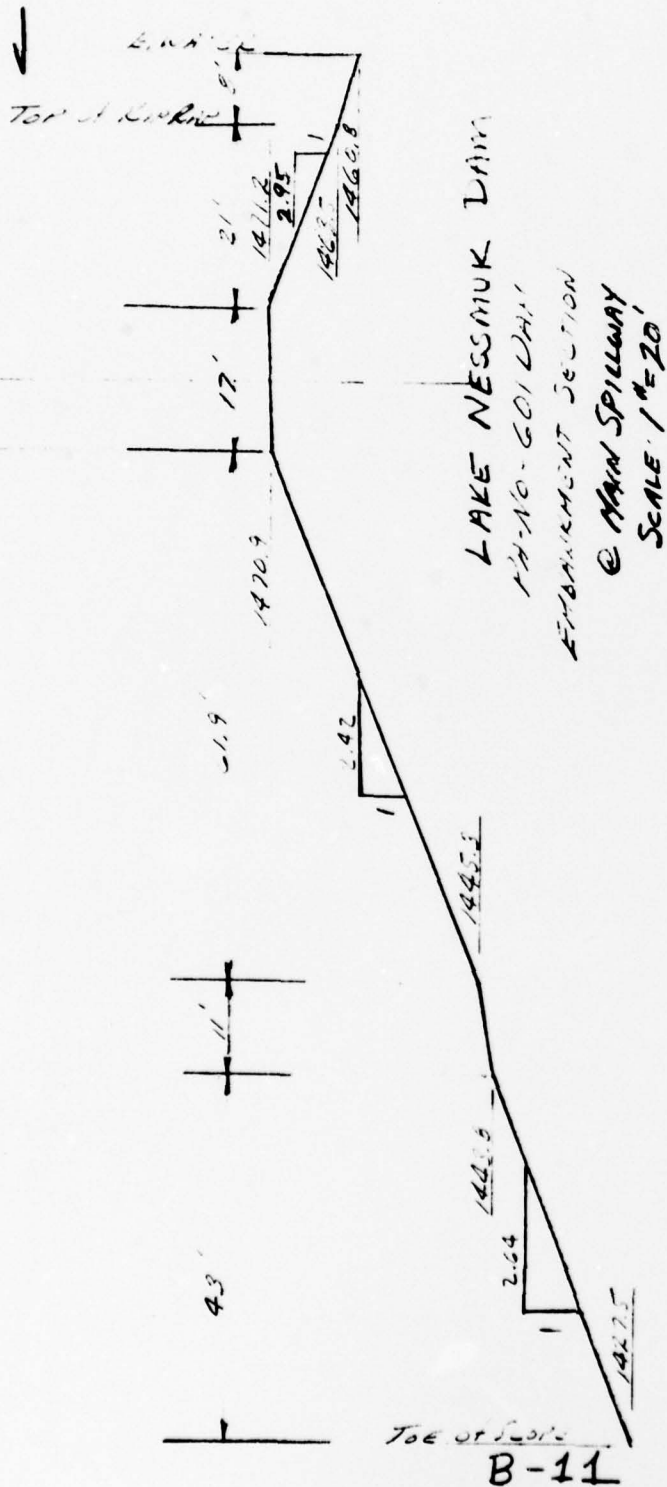
CHECKED BY _____

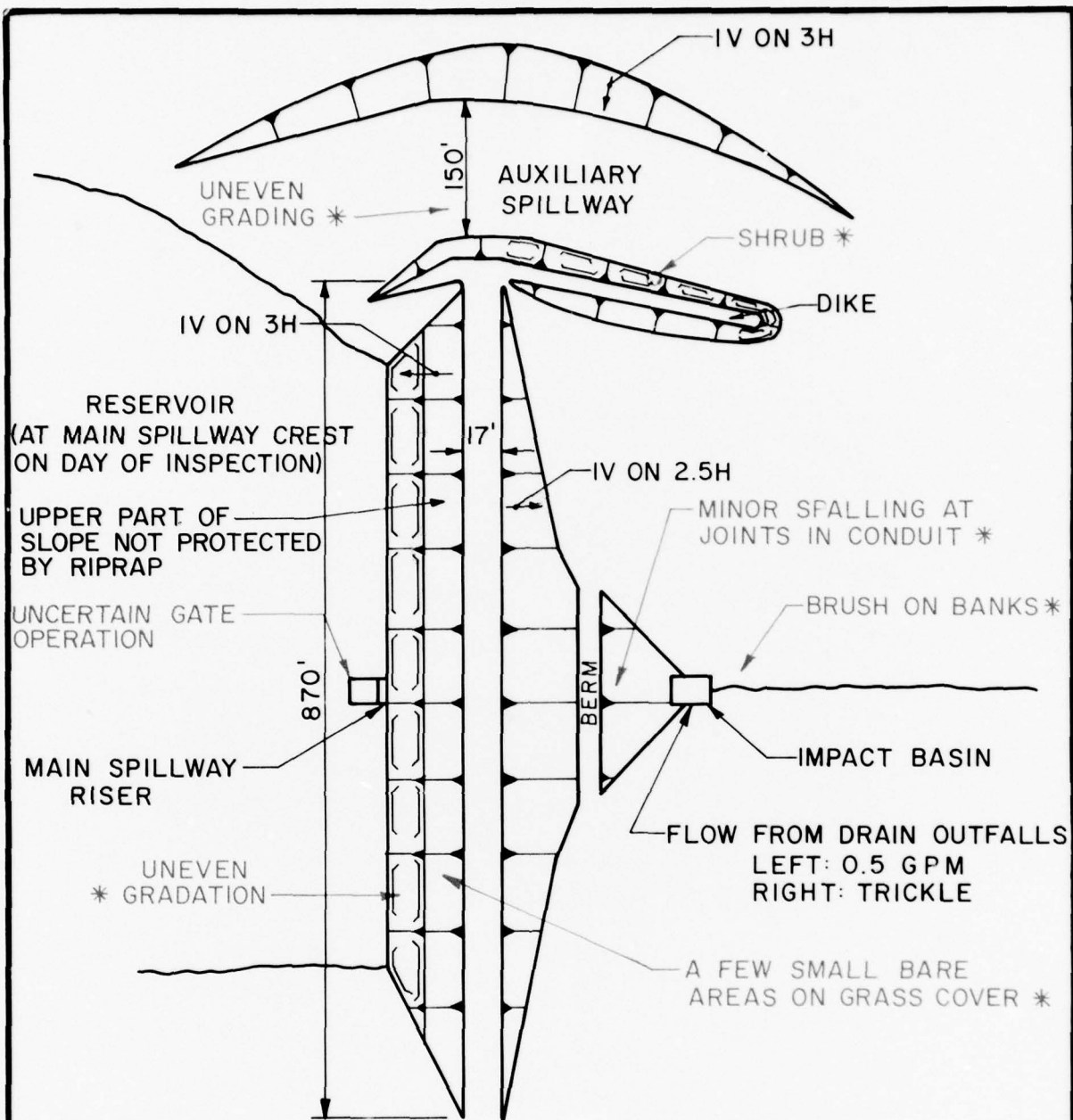
DATE _____



GANNETT FLEMING CORDRY
AND CARPENTER, INC.
HARRISBURG, PA.

SUBJECT PA-601 DAM FILE NO. _____
SHEET NO. _____ OF _____ SHEETS
FOR _____
COMPUTED BY _____ DATE _____ CHECKED BY _____ DATE _____





NOT TO SCALE

NOTE: ITEMS MARKED * ARE VERY MINOR AND ARE NOT CONSIDERED DEFICIENCIES.

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

LAKE NESSMUK DAM

PENNSYLVANIA FISH COMMISSION

RESULTS OF VISUAL INSPECTION

AUGUST 1979

PLATE B-1

SUSQUEHANNA RIVER BASIN
MORRIS BRANCH MARSH CREEK, TIOGA COUNTY
PENNSYLVANIA

LAKE NESSMUK DAM

NDI ID No. PA-00032
DER ID No. 59-66
SCS ID No. PA-601

PENNSYLVANIA FISH COMMISSION
PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

AUGUST 1979

APPENDIX C
HYDROLOGY AND HYDRAULICS

APPENDIX C

HYDROLOGY AND HYDRAULICS

In the recommended Guidelines for Safety Inspection of Dams, the Department of the Army, Office of the Chief of Engineers (OCE), established criteria for rating the capacity of spillways. The recommended Spillway Design Flood (SDF) for the size (small, intermediate, or large) and hazard potential (low, significant, or high) classification of a dam is selected in accordance with the criteria. The SDF for those dams in the high hazard category varies between one-half of the Probable Maximum Flood (PMF) and the PMF. If the dam and spillway are not capable of passing the SDF without overtopping failure, the spillway capacity is rated as inadequate. If the dam and spillway are capable of passing one-half of the PMF without overtopping failure, or if the dam is not in the high hazard category, the spillway capacity is not rated as seriously inadequate. A spillway capacity is rated as seriously inadequate if all of the following conditions exist:

- (a) There is a high hazard to loss of life from large flows downstream of the dam.
- (b) Dam failure resulting from overtopping would significantly increase the hazard to loss of life downstream from the dam from that which would exist just before overtopping failure.
- (c) The dam and spillway are not capable of passing one-half of the PMF without overtopping failure.

1/13/59

FREEBOARD HYDROGRAPH

No 15

HYDROGRAPH COMPUTATION FORM

Watershed MARSH CREEK State PA
 Structure Site or Sub-area #2 MORRIS CREEK
 Storm Distribution Curve B Hydrograph Family 1
 D.A. 1.63 sq. mi., Pt. Rainfall 8.74 inches, Aerial Rainfall 32.8 inches
 R.O. Condition II, R.O. Curve No. 76, Storm Duration or Freq. 6 hr
 $T_c = 1.09$ hrs., $Q = 17.44$ inches, $T_p = 0.686$ $T_c = .71$, $T_o = 5.6$ hr.

$\frac{T_o}{T_p}$ Computed = 7.90 $\frac{T_o}{T_p}$ used: 6 Revised $T_p = .93$ hr.

$q_p = \frac{484A}{\text{Rev. } T_p} = 848$ c.f.s. $q_p \times Q = 14,800$ c.f.s.

T (column) = $\frac{t}{T_p} \times \text{Rev. } T_p$ q (column) = $\frac{q_c}{q_p} (q_p \times Q)$

Check: $Q = \frac{(T_c)(\Sigma q)}{60A}$

Table 3.21-7 (sheet 1 of 2)

Line No.	$\frac{t}{T_p}$	$\frac{q_c}{q_p}$	T hours	q c.f.s.	Line No.	$\frac{t}{T_p}$	$\frac{q_c}{q_p}$	T hours	q c.f.s.
1	0		0	0	21		.005	8.18	74
2	0.44	.002	.41	44	22		.003	8.59	44
3	X	.013	.82	112	23		.002	9.00	30
4		.041	1.23	607	24		.001	9.41	15
5		.084	1.64	1240	25				
6		.176	2.05	2605	26				
7		.386	2.46	5710	27				
8		.497	2.86	7355	28				
9		.430	3.27	6360	29				
10		.335	3.68	4960	30				
11		.258	4.09	3820	31				
12		.202	4.50	2990	32				
13		.164	4.91	2420	33				
14		.139	5.32	2060	34				
15		.124	5.73	1830	35				
16		.100	6.14	1480	36				
17		.060	6.55	890	37				
18		.033	6.96	490	38				
19		.018	7.37	266	39				
20		.009	7.77	133	40				

$$Q = \frac{(1.09)(45630)}{645(1.63)} = 17.76$$

$$\%E = \frac{17.76 - 17.44}{17.44} = 1.3\%$$

GANNETT FLEMING CORDRY
AND CARPENTER, INC.
HARRISBURG, PA.

SUBJECT SCS FILE NO. _____
FREEBOARD STORM SHEET NO. _____ OF _____ SHEETS
FOR LAKE NESS MUK
COMPUTED BY AHV DATE _____ CHECKED BY _____ DATE _____

SCS DATA - FREEBOARD STORM (6HR)
RAINFALL = 20.8"
RUNOFF = 17.44"
Q PEAK INFLOW = 7355 CFS

PMF DATA:
SUSQUEHANNA BASIN

DISTRIBUTION

6 HR	118%
12 HR	127
24 HR	136
48 HR	142
72 HR	145

INDEX RAINFALL =
22.15"

ADJUSTMENT = 99%

(FROM HYDROMET 40)

REVISED INDEX = $22.15 \times .99 \times .8 = 17.54$ "

Hop BROOK FACTOR

TOTAL 6HR RAINFALL $1.18 \times 17.54" = 20.70"$

AS SMALL (e.g. 1.63 mi²) WATERSHEDS
ARE VERY SENSITIVE TO INTENSE (e.g. PEAK)
RAINFALL PERIODS, THE SCS 6-HR RAINFALL
IS SUFFICIENTLY CLOSE TO THE PMF.

SINCE THE INITIAL ABSTRACTION OF
1.0" IS ASSUMED TO HAVE BEEN ABSORBED
BY THE EARLY PART OF THE PMF, FOR
THE 6 HR PEAK: RUNOFF = $20.70" - 6 \times 0.05 \text{ INCHES/HOUR}$
= 20.40" THIS IS SLIGHTLY GREATER THAN
THE SCS RUNOFF OF 17.4". HOWEVER,
THE PEAK FLOW IS CONSERVATIVE BECAUSE
THE UNIT HYDROGRAPH IS CONSERVATIVE.

635-547 5-57
Tributary Computations

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

MARSH CREEK W/S PA-601

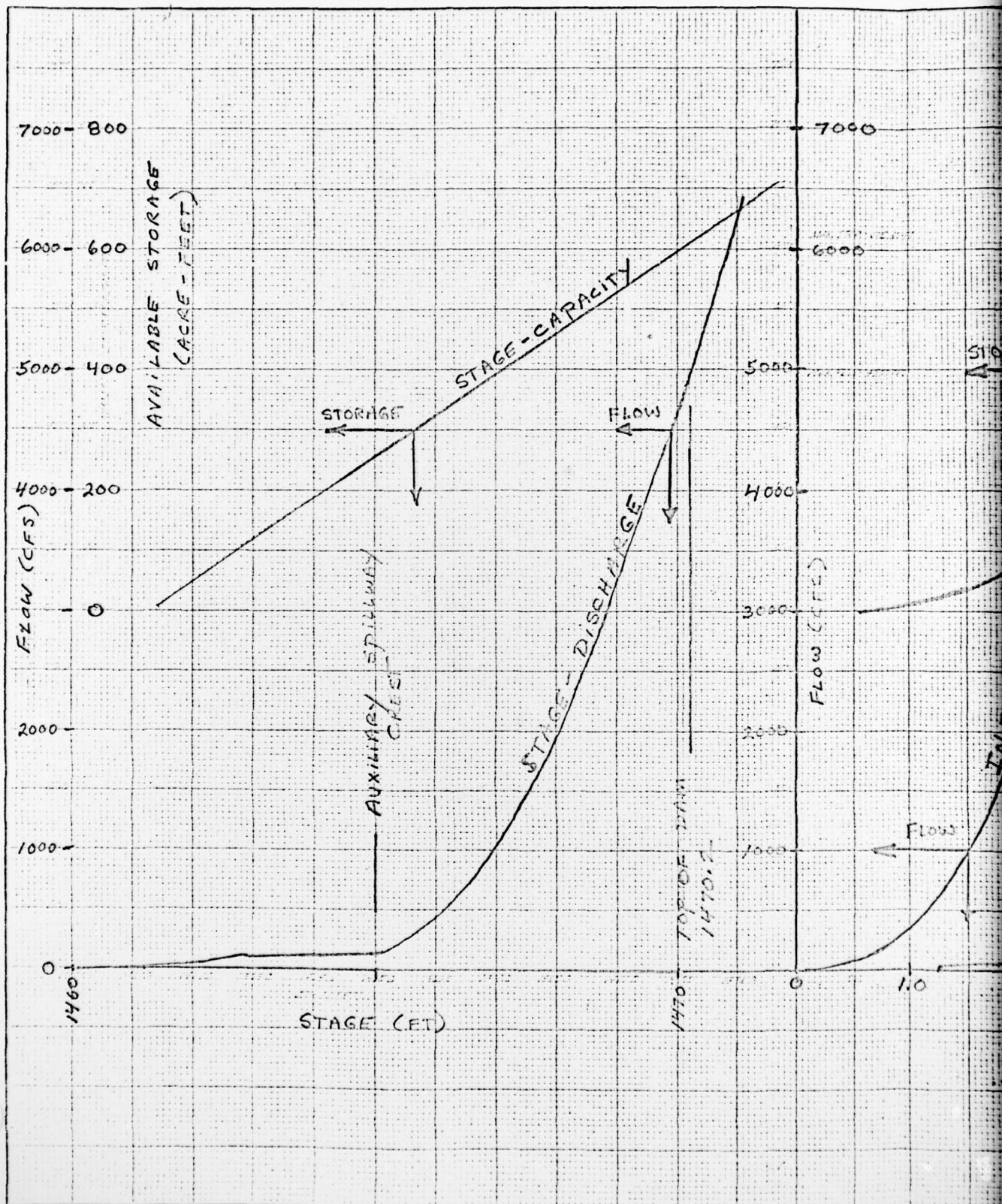
STAGE DISCHARGE COMPUTATIONS

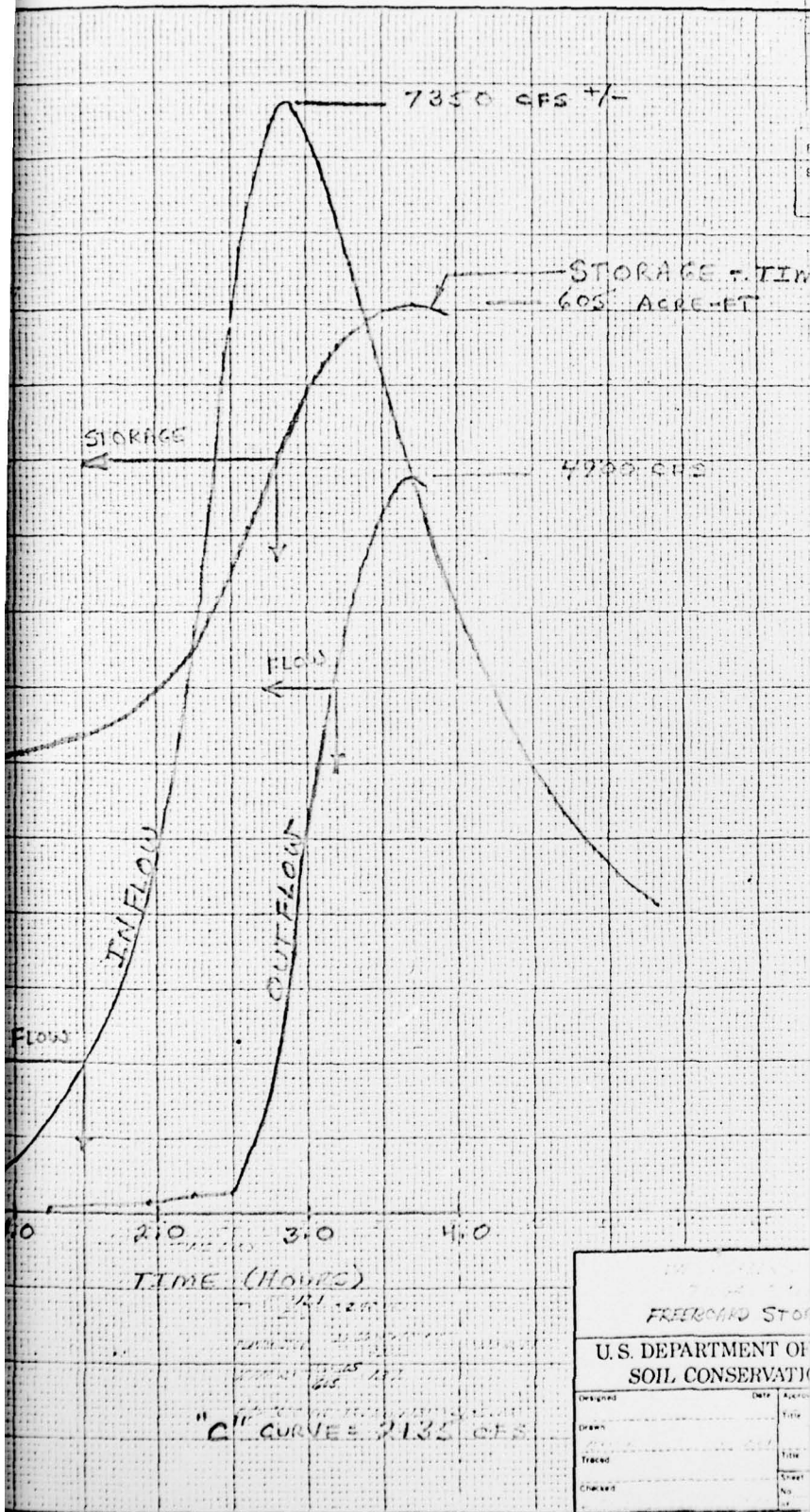
Stage	H_w	$H^{3/2}$	$Q_w = 38.75 H^{3/2}$ ($Q_{outlet} = 14250$)	H_p	$H^{1/2}$	$Q_p = 21.07 H^{1/2}$	q ES-124 SH 3/7 L=200	H_p	d_c	$E d_c = 2 d_c$	$b+z$ =150+
1460.9	0	0	0	35.9	5.99	126					
1461.5	0.6	0.46	18	—	—	—					
1462.0	1.1	1.16	45	37.0	6.08	128					
1462.5	1.6	2.04	79	—	—	—					
1463.0	2.1	3.04	113	38.0	6.16	130					
1463.5	2.6	4.19	162	38.5	6.20	131					
1465.0				40.0	6.32	133	0	0	0	0	150.
1466.8				41.8	6.46	136	5	1.76	0.92	1.84	151.
1467.7				42.7	6.53	138	10	2.65	1.46	2.92	152.
1468.4				43.4	6.58	139	15	3.39	1.91	3.82	153.
1469.0				44.0	6.63	140	20	4.04	2.32	4.64	154.
1470.1				45.1	6.72	142	30	5.14	3.04	6.08	156.
1471.1				46.1	6.79	143	40	6.14	3.70	7.40	157.
1461.3	0.4	0.25	10								
1461.2	0.3	0.16	6								

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

PENNSYLVANIA FISH COMMISSION

AUGUST 1979





45-11-12

RECEIVED IN THE OFFICE OF THE
NATIONAL DAM INSPECTION PROGRAM
DATE: JUN 7 1979
AD 1509

JUN 7 1979
C. J. McQuinn
Chief Engineer

ROUTING
AGRICULTURE
ON SERVICE

Working No.
PA-601

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM
LAKE NESSMUK DAM
PENNSYLVANIA FISH COMMISSION
FREEBOARD STORM ROUTING
AUGUST 1979
PLATE C-2

SUSQUEHANNA RIVER BASIN
MORRIS BRANCH MARSH CREEK, TIOGA COUNTY
PENNSYLVANIA

LAKE NESSMUK DAM

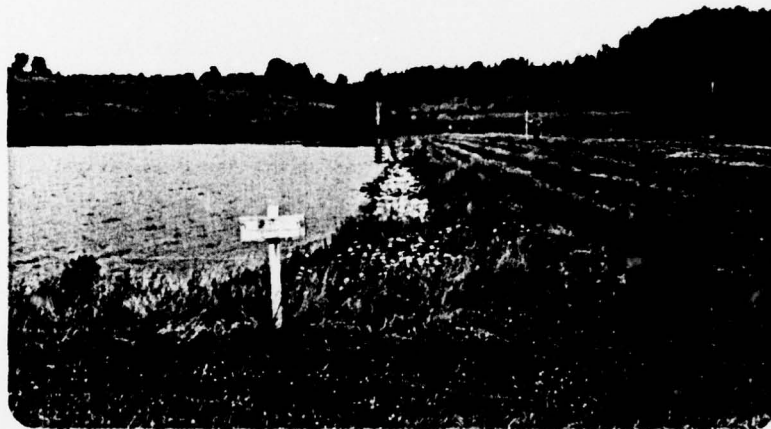
NDI ID NO. PA-00032
DER ID NO. 59-66
SCS ID NO. PA-601

PENNSYLVANIA FISH COMMISSION
PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

AUGUST 1979

APPENDIX D
PHOTOGRAPHS

LAKE NESSMUK DAM



A. Upstream Slope

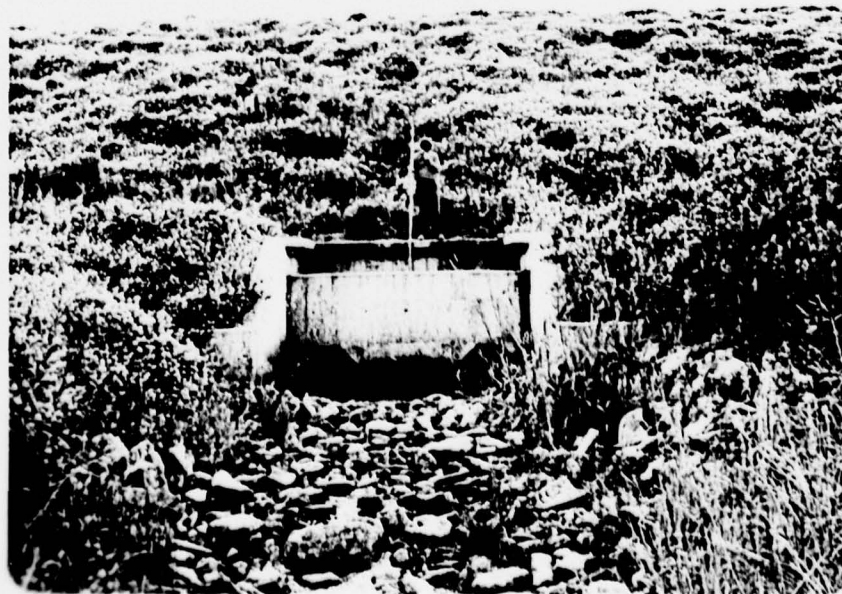


B. Downstream Slope

LAKE NESSMUK DAM



C. Main Spillway



D. Impact Basin

LAKE NESSMUK DAM



E. Auxiliary Spillway Approach Channel



F. Auxiliary Spillway Exit Channel

SUSQUEHANNA RIVER BASIN
MORRIS BRANCH MARSH CREEK, TIOGA COUNTY
PENNSYLVANIA

LAKE NESSMUK DAM

NDI ID No. PA-00032
DER ID No. 59-66
SCS ID No. PA-601

PENNSYLVANIA FISH COMMISSION
PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

AUGUST 1979

APPENDIX E

GEOLOGY

LAKE NESSMUK DAM

APPENDIX E

GEOLOGY

1. General Geology. The damsite and reservoir are located in Tioga County. With the exception of the southwest corner the entire county was glaciated during the Wisconsin glacial advance. Glacial features such as lakes, marshes, moraines, and terraces are almost lacking in the uplands of Tioga County. However, in the valleys, abundant evidence of glaciation has been preserved. Particularly in the valleys of the Tioga and Cowanesque Rivers and along Marsh Creek, Crooked Creek, and Upper Pine Creek. Drainage from glacial lakes in these valleys resulted in what is called the Pine Creek Gorge.

The rock formations exposed in Tioga County range in age from the Chemung Formation of Upper Devonian age to the Allegheny Formation of Pennsylvanian age. The oldest rocks crop out in three broad anticlinal folds in the north, central, and southern parts of the county. The youngest rocks are exposed in the Blossburg Coal Basin. Most of the plateau remnants are capped by the Pocono Formation, with smaller remnants of the Pottsville Formation. The intermediate slopes are underlain by the Cattaraugus and Oswayo Formations.

The geologic structure of Tioga County displays a series of well-defined folds with marked continuity trending east-northeast. Evidence of doming is observed on the Sabinsville, Wellsboro, and Towanda anticlines. In all the domed areas the south limb is appreciably steeper than the north limb. The regional plunge of the folds is to the southwest and generally they decrease in amplitude with distance from the Allegheny Front. Surface evidence of faulting is observed on the south flank of the Sabinsville Anticline in Tioga Township, on the Wellsboro Anticline southeast of Wellsboro, and on the Towanda Anticline in Union Township. Subsurface faults have been noted during drilling some deep wells in the area.

2. Site Geology. The dam is founded on Chemung Siltstone of Devonian age. Glacial till overlies the siltstone and is essentially a sandy, gravelly clay. Alluvial and colluvial deposits were found in the floodplain near the centerline. The Chemung formation is composed of fine-grained sandstone and siltstone with interbedded shale. Bedding is well developed. This formation is moderately to slightly resistant to weathering. Gentle slopes of medium relief in this area are typical of the dissected plateau in which this dam is located.

The dam is founded on overburden. Excerpts from the design analysis concerning the foundation are presented hereafter.

10-59

DETAILED GEOLOGIC INVESTIGATION OF DAM SITES

State Penna. County Tioga Watershed Marsh Creek Subwatershed Morris
Site number Pa-601 Site group I Structure class C Investigated by J. J. [signature] (signature and title) Date: Oct. 22, 1961

INTERPRETATIONS AND CONCLUSIONS

High permeability of the foundation is the major problem anticipated in the design and construction of this multipurpose development. The coefficients of permeability determined by carefully controlled field tests are extremely high for till of the character seen in the samples. However, sample recovery was generally less than 70% of the drive length and often much less. It is assumed that lenses of clean gravel exist and were either pushed aside by the sampler or else fell from the sampler on withdrawal.

These coefficients are assumed to represent horizontal, or nearly horizontal, permeabilities along piping planes within the till. If this is true, a direct route for water from the pool to these planes exists through the deep pervious alluvium in the pool area. In other words, vertical permeability of the till has little influence on seepage losses because the pervious zones of till directly contact the pervious alluvium. Further piping would develop from this rapid seepage beneath the proposed structure unless a positive cutoff is installed. Filter drains could control piping, but not water loss.

Consideration should be given to differential consolidation between areas of deep alluvium and areas of shallow alluvium within the lower foundation and principal spillway locations.

No rock excavation will be encountered any place on the site, but wet excavation should be expected if a deep cutoff is used.

Borrow material is adequately available from the pool area within 900 feet of the centerline and from the emergency spillway excavation. This soil will be stable and impervious when compacted in the fill.

